THE ROYAL SANITARY INSTITUTE FOUNDED 1876.

SALUS GENERIS HUMANI.


THE ROYAL SANITARY INSTITUTE, FOUNDED 1876.
SALUS GENERIS HUMANI.

1913.

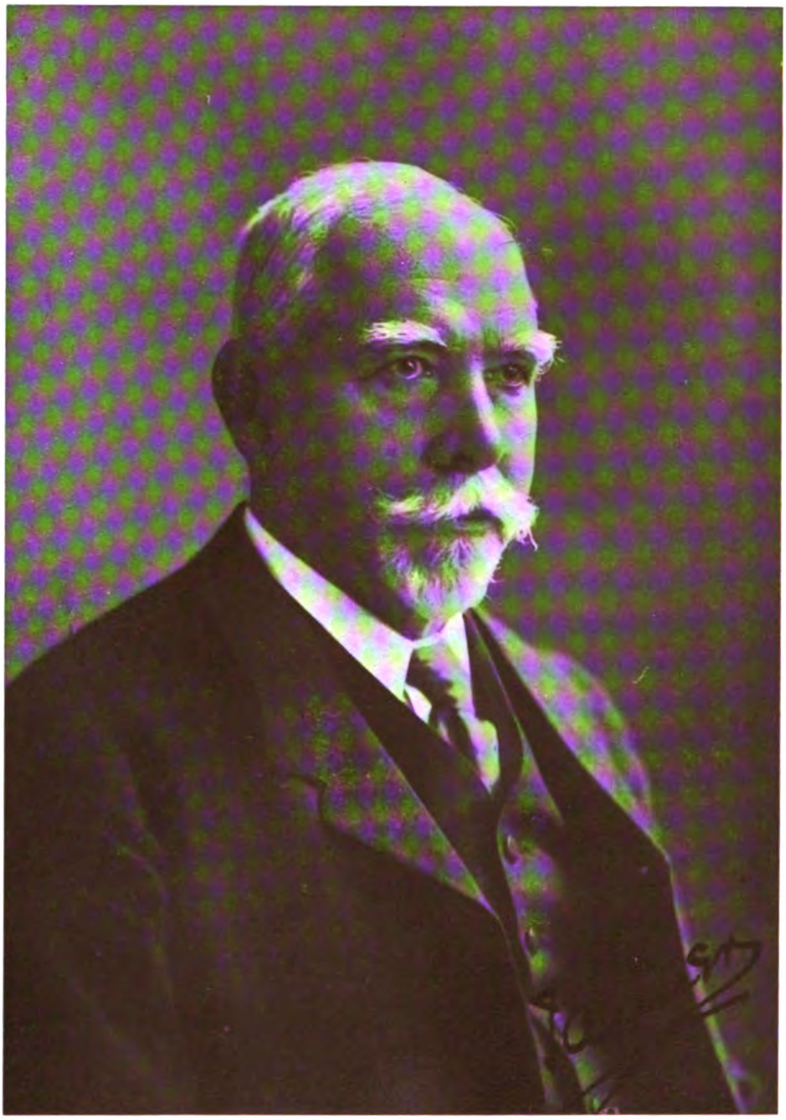


Photo. J. Russell & Sons.

Sir HENRY TANNER, C.B., I.S.O., F.R.I.B.A.,

Elected Chairman of Council, 1913.

JOURNAL

OF

THE ROYAL SANITARY INSTITUTE.

TRANSACTIONS, VOL. XXXIV.

1913.

LONDON:

OFFICES OF THE ROYAL SANITARY INSTITUTE,
90, BUCKINGHAM PALACE ROAD, S.W.

EDWARD STANFORD, LTD., 12, 13, 14, LONG ACRE, W.C.

1914.

THE ROYAL SANITARY INSTITUTE.

[Past-Presidents.]

HIS GRACE THE LATE DUKE OF NORTHUMBERLAND, K.G. (1877–1893).

H.R.H. THE LATE DUKE OF ALBANY, K.G. (1882–1884), (Parkes Museum).

HIS GRACE THE LATE DUKE OF WESTMINSTER, K.G. (1893–1896).

H.R.H. THE LATE DUKE OF CAMBRIDGE, K.G. (1896–1904).

HIS GRACE THE DUKE OF NORTHUMBERLAND, K.G., P.C., F.R.S. (1904–1913).

COLONIAL BRANCHES OF THE INSTITUTE.

WESTERN AUSTRALIA.

Patron.—HIS EXCELLENCY THE GOVERNOR (Sir Gerald Strickland, K.C.M.G.
President.—DAVID ERNEST WILLIAMS, L.R.C.P.I., L.R.C.S.I.
Hon. Secretary and Treasurer.—F. J. HUELIN.

SOUTH AFRICA.

Chairman of the Council.—A. JASPER ANDERSON, M.A., M.B., D.P.H.
Treasurer.—ARTHUR H. REID, F.R.I.B.A.
Hon. Secretary.—PROF. A. E. SNAPE, M.Sc., Assoc.M.Inst.C.E.

NEW ZEALAND.

Hon. Secretary and Treasurer.—J. P. FRENGLEY, M.D., D.P.H.

BRITISH COLUMBIA.

Chairman.—F. T. UNDERHILL, L.R.C.P., F.R.C.S.Edin., D.P.H.
Hon. Secretary and Treasurer.—L. ROBERTSON.

Stacks

OFFICERS OF THE INSTITUTE FOR 1913—1914.

Patron.
HIS MAJESTY THE KING.

Patroness.
H.R.H. THE DUCHESS OF ALBANY.

President.
THE RIGHT HON. THE EARL OF PLYMOUTH, P.C.

Vice-Presidents.
HIS GRACE THE LORD ARCHBISHOP OF YORK.
HIS EXCELLENCY THE EARL OF ABERDEEN, K.T., G.C.M.G., G.C.V.O.
RIGHT HON. ROBERT FARQUHARSON, P.C., M.D., LL.D.
SIR WILLIAM HENRY PREECE, K.C.B., F.R.S., M.INST.C.E. (deceased).
SIR B. ARTHUR WHITELEGGE, K.C.B., M.D., B.Sc.
THE HON. SIR JOHN A. COCKBURN, K.C.M.G., M.D.
SIR ALEXANDER BINNIE, M.INST.C.E.
SIR WILLIAM J. COLLINS, D.L., J.P., F.R.C.S., M.D., D.P.H.
SIR WILLIAM EMERSON, F.R.I.B.A.
SIR SHIRLEY F. MURPHY, F.R.C.S.
SIR ASTON WEBB, C.B., C.V.O., R.A., F.R.I.B.A.
A. WYNTER BLYTH, BARRISTER-AT-LAW, M.R.C.S., F.I.C., F.C.S.

Registrar.
A. WYNTER BLYTH, BARRISTER-AT-LAW, M.R.C.S., F.I.C., F.C.S.

Treasurer.
COL. J. LANE NOTTER, R.A.M.C., M.A., M.D.

Council.
SIR HENRY TANNER, C.B., I.S.O., F.R.I.B.A. *Chairman.*
H. PERCY BOULNOIS, M.INST.C.E., *Deputy Chairman.*

HENRY ADAMS, M.INST.C.E.
J. PATTEN BARBER, M.INST.C.E.
PHILIP BOOBBYER, M.D., M.S., M.R.C.S.
GEORGE FEARNLEY CARTER, M.INST.C.E.
A. K. CHALMERS, M.D., D.P.H.
EDWIN T. HALL, F.R.I.B.A.
A. WELLESLEY HARRIS, M.R.C.S., D.P.H.
ERNEST V. HILEY.
PROF. A. BOSTOCK HILL, M.D., M.SC., F.I.C., D.P.H.
E. W. HOPE, D.SC., M.D.
WILLIAM J. HOWARTH, M.D., CH.B., D.P.H.
LIEUT.-COL. A. S. JONES, V.C., M.INST.C.E.
HERBERT JONES, L.R.C.S.I., L.M., D.P.H.CAMB.
W. KAYE-PARRY, M.A., M.INST.C.E., F.R.I.B.A.
PROF. H. R. KENWOOD, M.B., D.P.H., F.R.S.E.
E. J. LOVEGROVE, M.INST.C.E.
J. DOUGLASS MATHEWS, F.R.I.B.A., F.S.I.
LOUIS C. PARKES, M.D., D.P.H.,
CHARLES PORTER, M.D., B.SC.
SAMUEL RIDEAL, D.SC., F.I.C., J.P.
HENRY ROFE, M.INST.C.E., F.G.S.
H. D. SEARLES-WOOD, F.R.I.B.A.
J. OSBORNE SMITH, F.R.I.B.A.
A. SAXON SNELL, F.R.I.B.A.
FRANK SUMNER, M.INST.C.E.
W. C. TYNDALE, M.INST.C.E.
WM. WHITAKER, B.A., F.R.S., F.G.S., ASSOC. INST.C.E.
HERBERT WILLIAMS, M.D.LOND.
JOHN EDWARD WORTH, M.INST.C.E.

Auditors.
W. COLLINGRIDGE, M.A., M.D., LL.M., D.P.H. | WOOD, DREW & CO.

Hon. Solicitor.—FREDERIC WILLIAM EMERY.

Secretary and Director.
E. WHITE WALLIS, F.S.S.

Bankers.
THE UNION OF LONDON AND SMITHS BANK LTD., VICTORIA STREET BRANCH.

The Institute is not responsible for the facts and opinions advanced in the Addresses, Papers, and Articles published in the Journal.

TABLE OF CONTENTS.

CONGRESS AT YORK, 1912.

.. Table of contents of Supplement follows page 652.

CONGRESS AT EXETER, 1913.

CONGRESSES AND CONFERENCES HELD BY THE INSTITUTE.

Date.	Town.	President.
1877.	Leamington.	B. W. Richardson, M.D., LL.D., F.R.S.
1878.	Stafford.	Edwin Chadwick, C.B.
1879.	Croydon.	B. W. Richardson, M.D., LL.D., F.R.S.
1880.	Exeter.	The Right Hon. Earl Fortescue.
1882.	Newcastle-on-Tyne.	Capt. Douglas Galton, R.E., C.B. D.C.L., F.R.S.
1883.	Glasgow.	Prof. G. M. Humphry, M.D., F.R.S.
1884.	Dublin.	Sir Robert Rawlinson, C.B.
1885.	Leicester.	Prof. F. De Chaumont, M.D., F.R.S.
1886.	York.	Sir Spencer Wells, Bart.
1887.	Bolton.	The Right Hon. Lord Basing, F.R.S.
1889.	Worcester.	G. W. Hastings, M.P., J.P.
1890.	Brighton.	Sir Thomas Crawford, K.C.B., M.D.
1892.	Portsmouth.	*Hon. President:* H.R.H. The Duke of Connaught, K.G. Sir Charles Cameron, M.D., F.R.C.S.I.
1894.	Liverpool.	Sir Francis Sharp Powell, Bart., M.P.
1896.	Newcastle-on-Tyne.	The Right Hon. Earl Percy, P.C.
1897.	Leeds.	Robert Farquharson, M.D., F.R.C.P., M.P., D.L., J.P.
1898.	Birmingham.	Sir Joseph Fayrer, Bart., K.C.S.I., M.D., LL.D., F.R.S.
1899.	Southampton.	Sir William H. Preece, K.C.B., F.R.S.
1900.	Paris.	Prof. W. H. Corfield, M.A., M.D., F.R.C.P.
1900.	London.	Housing of the Working Classes.
1901.	London.	Water Supplies and River Pollution.
1902.	Manchester.	The Right Hon. Earl Egerton of Tatton.
1903.	Bradford.	The Right Hon. Earl Stamford.
1904.	Glasgow.	The Right Hon. Lord Blythswood.
1905.	London.	School Hygiene. Sir Arthur Rucker, D.Sc., LL.D., F.R.S.
1905.	London.	Smoke Abatement. Sir Oliver Lodge, D.Sc., LL.D., F.R.S.

DATE.	TOWN.	PRESIDENT.
1906.	BRISTOL.	THE RIGHT HON. SIR EDWARD FRY, P.C., D.C.L., F.R.S.
1907.	DUBLIN.	*Patron:* HIS EXCELLENCY THE EARL OF ABERDEEN, K.T., P.C. RT. HON. THE EARL OF ROSSE, K.P., F.R.S.
1907.	LONDON.	Exhibition in connection with Second International Congress on School Hygiene.
1908.	CARDIFF.	THE RIGHT HON. THE EARL OF PLYMOUTH, P.C.
1909.	LEEDS.	Joint Health Congress. COL. T. W. HARDING, LL.D., J.P., D.L.
1910.	BRIGHTON.	THE RIGHT HON. SIR JOHN A. COCKBURN, K.C.M.G., M.D.
1911.	BELFAST.	*Patron:* HIS EXCELLENCY THE EARL OF ABERDEEN, K.T., P.C., K.C.M.G. THE RIGHT HON. LORD DUNLEATH, D.L., J.P.
1911.	CAPE TOWN, SOUTH AFRICA.	SIR FREDERIC DE WALL, KT.
1912.	YORK.	*Patron:* H.R.H. PRINCE ARTHUR OF CONNAUGHT, K.G., G.C.V.O. HIS GRACE THE LORD ARCHBISHOP OF YORK.
1912.	PERTH, WESTERN AUSTRALIA.	*Patron:* H. E. SIR GERALD STRICKLAND. DR. JAMES HOPE, D.P.H.
1913.	JOHANNESBURG, SOUTH AFRICA.	W. R. BOUSTRED, MAYOR.
1913.	EXETER.	THE RIGHT HON. EARL FORTESCUE, K.C.B.

Volume XXXIV. No. 1. Issued February, 1913.

JOURNAL

OF

THE ROYAL SANITARY INSTITUTE

CONGRESS AT YORK.

CONFERENCE I.—MUNICIPAL REPRESENTATIVES.

Presidential Address, by the Right Hon. THE LORD MAYOR OF YORK (Alderman Norman Green), President of the Conference.

YOU will expect me to tell you something of the efforts we are making to preserve the public health and general amenity of this splendid heritage we have had committed to our trust and keeping, and I think you will agree with me that, as a rule, old cathedral cities do not move with startling rapidity. The ancient environment of the place seems to have a lethargic influence upon its inhabitants, or, may be, begets a feeling that what has done for so many hundreds of years, should suffice for the present generation. This may be gauged, perhaps, so far as York is concerned, from the fact that our present excellent medical officer of health is the first whole-time official to be appointed to the position. Dr. Smith has been with us twelve years, but we have had a part-time medical officer of health since 1873. Still, slow as we have perhaps been in taking up the public health work of the city, during the past fourteen years we have made immense strides in the direction of eradicating the slum dwelling, and the abolition of privy middens in favour of water closets. The year 1899 witnessed the commencement of a campaign in the city for the prevention of consumption, while in 1902 the system of voluntary notification was instituted with excellent results. The earlier effort, I am told, was about the first to be undertaken by any local governing body in the country. Our endeavours, perhaps, have been directed to the preventive, rather than the curative side, but at the present time we have

a scheme before the Local Government Board for the establishing of a tuberculosis dispensary and sanatorium, with a full complement of qualified medical officers. The Notification of Births Act, a system of health visitors, with an abundant supply and distribution of educational leaflets treating of the prevention of infectious diseases, the rearing and feeding of infants and the various ills of childhood, have done much to dispel ignorance and reduce the infantile mortality in the city. Indeed, by means of these and various other agencies, we have succeeded in reducing our death-rate to such an extent that it usually ranks about one of the lowest in the kingdom, and is almost invariably much below the average of the 76 great towns. No records are available prior to 1841 (probably none were kept), but from that year to 1870, the average death-rate of the city was 24 per 1,000, whereas from 1906 to 1911 it had been reduced to 13·2.

Our average birth-rate during the same periods, like that of most other towns, shows, I am sorry to say, a somewhat serious decline, and in this connection I should like to say, that if any member of The Royal Sanitary Institute, or any of our visiting friends, can suggest a panacea for that evil he will confer, not only upon this city, but upon his country, a lasting boon.

Probably our medical officer of health will explain in detail the round-dozen agencies that have been established in the city, and are in full working order, for dealing with almost every ill to which flesh is heir; and no doubt our engineer will take the opportunity of showing you how keenly alive his department is to the need for a thorough scavenging of the streets, and the disposal and treatment of the city's refuse. I hope also he will take the opportunity of showing such of you as are interested our excellent and up-to-date sewage works. For my own part, as chairman of the Estates Committee, I should like to acknowledge how generously I and my committee are always met by the City Council in our efforts to provide open spaces and recreative amusement in the city. During the past two years we have been thus able to construct and maintain five municipal bowling greens, while two others are in process of construction. In addition to these we have opened three children's playgrounds, while others have been provided through the generosity of our citizens. Undoubtedly we have made the lot of our poorer brethren much more endurable within recent years, and are vain enough to think that we have also made York a decidedly attractive place of residence for those of ampler means.

The Working of the Housing Clauses of the Housing and Town Planning Act of 1909, by J. WRIGHT MASON, M.B., C.M., D.P.H., M.R.C.S.E., Medical Officer of Health for the City and Port of Kingston-upon-Hull (FELLOW).

TOWN planning is the mapping out by local authorities of towns as a whole, instead of permitting them to extend in an irregular manner without thought of still further development.

The Housing and Town Planning, etc., Act of 1909, so far as regards that part of it which relates to the housing of the working classes, does not in principle mark any new departure in legislation. On the contrary, it is an amending Act, and the last of a series of Housing Acts extending over nearly sixty years. It was in 1851 that the legislature made the first attempt to solve the modern social problem of securing for the working-class population suitable dwelling accommodation from a sanitary point of view. The Act of 1890 is the starting point or principal Act in the existing housing legislation, but it has itself been amended by Acts passed in 1893, 1894, 1896, 1900, and 1903, and still more important amendments have been made by the Act of 1909. These Acts, which are to be construed together, are known as the Housing of the Working Classes Acts, 1890 and 1909.

In order to give a general view of the law with regard to the housing question as it now stands under the above Acts it is necessary, in the first place, to set out the object of the principal Act of 1890, which has three main divisions, Parts 1, 2, and 3, the short effect of which is as follows:—

Part 1 deals with the clearance of large slum districts and, incidentally, with the re-housing of the members of the working classes thus displaced. It does this by giving power to municipalities to purchase all the properties comprised in such district, and to plan out the whole area afresh under an improvement scheme which has to provide for the clearance of the site and the re-arrangement of the streets and houses within it; which improvement scheme has to be submitted to and confirmed by the Local Government Board, and, if confirmed, had formerly to be embodied in a Provisional Order and confirmed by Parliament. The rebuilding of the necessary dwellings on the site thus newly laid out cannot be done by the local authority without the express approval of the Board, but they may clear the site and lay out and complete the streets, and sell off the other land to persons, conditionally on such persons erecting and maintaining the necessary dwellings.

Part 2 has a more limited scope than Part 1, and deals with the

subject of unhealthy dwellings as distinguished from unhealthy areas. This is effected in three ways: (1) by the closing and demolition of houses unfit for human habitation; (2) by the removal of buildings which obstruct the passage of light and air; and (3) by the reconstruction of small areas which are not sufficiently large to be made the subject of an improvement scheme under Part 1. It is this part of the Act under which local authorities have taken action.

Part 3 is intended to facilitate the erection of workmen's houses in neighbourhoods where such houses are required and are not likely to be otherwise provided. In other words, where there is a shortage of houses. It is not confined to unhealthy areas, and enables municipalities to purchase land, and either to erect the houses and then let them or to sell the land on building leases to persons who would erect and maintain such dwellings. It differs from Parts 1 and 2 in this important respect, that until the passing of the Act of 1909 it was adoptive only, and was, in fact, adopted by very few local authorities.

It is scarcely too much to say that, with the exception of that portion of Part 2 relating to the closing of unhealthy dwellings, the 1890 Act has practically remained a dead letter. In other words comparatively little action was taken under it, and the reason of this was that it was found to be almost unworkable by reason of the cumbrous and dilatory procedure which the Act laid down in order to put its provisions into operation.

With regard to Part 2, relating to unhealthy dwellings, it has been necessary hitherto to summon the owner before a magistrate and apply to such magistrate for the closing order, but under the Act of 1909 a local authority have themselves power to make the order, and, indeed, are required to make it when it appears to them that a house is in such a state as not to be reasonably fit for habitation. If the owner is aggrieved he can appeal against it, but such appeal is to the Local Government Board, whose decision is final.

It is interesting to note that contrary decisions appear to have been given by the Local Government Boards of England and Scotland.

The English Local Government Board have given as their decision that when once a local authority had closed a building, it was not competent for the owner to do anything with that building except to reconstruct it so as to make it suitable for a dwelling house, and that it was not competent for him in the interim to turn it into a workshop.

The Scottish Local Government Board, on the other hand, have taken

an entirely different view, and stated that if the owner, after a closing order becomes operative, determines to put the condemned building to a different use, the local authority have no power to prohibit such use of the building by demolishing it, unless it is a nuisance or dangerous or injurious to the health of the public or of the inhabitants of the neighbouring dwelling houses.

It seems not only superfluous but unjustifiable to demolish a building which, though absolutely unfit for human habitation, is yet quite fit for use as a store or something similar.

The powers of the Local Government Board to ensure the due carrying out of the provisions of the Act of 1890 are also very largely extended, and they are even authorised, in case of default on the part of the local authority, to prepare schemes themselves.

Small class houses which come within the rental specified for the various cities, towns and villages, and have been let after the passing of the 1909 Act, are to be in all respects reasonably fit for human habitation, and must be kept so. Under Section 15, right of entry is given to local authorities, and their officers may enter any house or premises coming within the above definition, with a view to ascertaining their condition, and may specify the work necessary to be done to render the house reasonably habitable, if the house is not in a condition such as to warrant a closing order being made. If it can be rendered habitable, it is not necessary to cause the removal of the tenants. Where there is a dearth of this class of house, this is undoubtedly a great advantage. Under the old Act it was not necessary to detail the work required, and this was often the cause of confusion, for it was often found that the work carried out by the owner did not comply with the requirements of the sanitary authority. I am of opinion that ordinary sanitary alterations can be met by the Public Health Act of 1875 and amending Acts.

I have dealt as briefly as possible with the Act and its bearing upon the principal Act of 1890. Speaking generally, it may be said that the object of the Act of 1909 is to render the procedure for carrying out the Act of 1890 much simpler, more expeditious and less costly, and now that the necessary procedure has been simplified in accordance with the views of local authorities, there is no doubt that the Local Government Board require the Acts to be carried into effect wherever necessary.

Regulations have been made by the Local Government Board, setting out the manner in which inspections of a district under Section 17 (1) of the Act of 1909 shall be carried out, and details and records of the

systematic inspections are to be kept. These suggestions had been previously carried out by municipalities as a part of the public health administration.

Housing reform implies much more than sanitation in the home and its surroundings. The growth of our large urban communities has brought about a new condition of life, which can only be dealt with by new methods of treatment.

The health or otherwise of a community may be gauged by its density of population, and the accumulation of filth, which is not only the means of originating, but propagating disease. The insidious and indistinctly recognisable deleterious effects upon health of a continued exposure to unhealthy conditions is often more marked in the case of impure air than of impure water. The evil effects of such exposure are slowly, but surely, laid in such a manner as often to escape the observation of the expert medical man, who may diagnose a case of blood deterioration, brought about by impure air, as one of imperfect or defective assimilation.

I believe there is an intimate relationship between the housing accommodation and dietetics on the one hand, and physical efficiency and educational progress on the other. The children from our poorer and more densely populated districts do not show the same perception for education as those placed in better circumstances and surroundings, and this, no doubt, may be attributed in a great measure to the circumstances under which they live.

It has been ascertained that only some 2½ per cent. of the children attending the public elementary schools attain to anything like distinction in after life, whereas the percentage was 10 per cent. in the case of children attending higher or middle-class schools.

The diseases more especially due to congestion of population and density per house, or per room, are such as tuberculosis, typhus fever, diphtheria, and scarlatina, and these diseases subsequently spread to areas in which there is no overcrowding.

It is a recognised statistical law, that the mean duration of life decreases as the proximity of one individual to another increases. The houses in localities which we, to-day, wish to reform were erected by the sanction of the local authorities in the past, and while it is the owner's duty to keep his property in repair, it is the duty of the local authority to see that this is done, and, further, to see that houses comply, as far as practicable, with modern ideas and requirements.

If we are to maintain and improve our position as a nation, it must be remembered that our health is of supreme importance, and local authorities

must remember that cities and towns are only units of the Empire, and that they are responsible for the welfare of these units.

Drunkenness invariably leads to poverty and to the lowering of the vitality of the individual, thus rendering him susceptible to disease. It is these unfortunate people, who have no ambition and no wish to improve the surroundings in which they live, who form by far the greatest part of dwellers in the slums of our large cities.

In order to solve the problem of the gradual extinction of insanitary houses and the possible improvement of some, we must be assisted by the dwellers themselves.

The problem of how to deal with insanitary properties differs in various towns. In some it may be desirable to pull down the houses entirely and rebuild new dwellings on the sites, while in others it might be possible to so repair and alter the already existing dwellings as to make them reasonably habitable. The latter course is an exceedingly doubtful one, as in my experience, sooner or later the properties again fall into disrepair, and therefore the action taken does not lead to any permanent improvement.

Buildings of suitable elevation and with wider spaces between them seem to be a necessity, especially in large industrial and commercial centres. The essential requirements of every dwelling, however small, should be self-contained, so that the responsibility for their cleanliness and preservation can be fixed upon the individual occupying them.

In this class of property, each dwelling house should, as far as possible, be adapted for the class of people by whom it is intended it should be occupied, and in planning them, regard should be had to the provision of open spaces to be used as playgrounds and airing grounds.

Flats or double-storied buildings are not to be commended, as wherever a common occupancy is resorted to, the conveniences and yards attached thereto become more or less neglected, owing to the responsibility being a collective instead of individual.

I admit that the easy modes of locomotion provided by municipalities has been the means in recent years of inducing many of our artizans to live in the outlying districts where there is better housing accommodation and less overcrowding, but there remains a class who have possibly no choice but to live in the immediate vicinity of their occupation.

In my opinion, overcrowding does not produce a specific disease without the introduction of a peculiar germ or toxin produced by germ life, but such diseases, when once brought about, rapidly increase and assume a more virulent type in conditions of overcrowding where the general laws of health have been neglected and disregarded.

With regard to the accommodation of the people displaced by the condemnation of houses under Part 2, the best way is to build houses in the same locality in sections, thus displacing the population in sections, and not as a whole as is often the case. This course is preferable on account of the fact that the people frequently do not occupy houses provided elsewhere for them.

The President of the Local Government Board said in introducing the Bill of 1909:—"I trust that the chief benefits of this Act will be, first, fewer houses per acre, more space and gardens about the dwellings, more attractive frontages, larger rooms, universal bath accommodation, and all the conveniences that are so necessary in urban life, and without which, even in rural areas, an ugly and cramped house and curtilage is but a shelter, and not that resting place, sanctuary, and home which a comfortable dwelling should be."

I previously alluded to the advantage of the self-contained house over block dwellings. Mr. Aldridge has stated that the cost of the block dwelling per room, apart altogether from the land cost, is higher than the cost of the cottage per room, consequently the accommodation provided for a given sum is less in the block than in the cottage.

He further states that between 1893 and 1905 the London County Council erected 3,300 dwellings in blocks, with 8,726 rooms, and the cost of these blocks, erected as they have been in many parts of London, and under a variety of conditions, may be regarded as giving an accurate index to the cost of building blocks throughout London.

The building cost per room of these dwellings, apart from site cost, varies from £70 to £140 per room. The average building cost per room prior to 1902 was £102, but as a result of some economies in building methods, the average building cost has been reduced to £92 per room.

The self-contained cottage is much superior to the block system from a hygienic point of view. Death-rates are lower in the cottage towns of England than in the block towns of Germany. Consumption takes almost twice as many victims from the block dwellings of Germany as from the English cottage home. The infant death-rate is far higher in block dwellings than in cottage homes.

The building cost per room of cottages varies from £30 to £55 (Alderman Thompson in "Housing Up-to-date"). These figures prove conclusively that in Great Britain, the cost per room in the cottage for both building and site is less than the cost per room in the block.

The block method of housing was introduced into Great Britain between 1850 and 1880, and had a brief popularity, the name "model

dwelling" being given to this type of dwelling. Outside London, however, the proposal to erect model dwellings failed to secure approval.

Manchester, Liverpool, Nottingham, and a few other towns, made experiments of a costly kind in building these dwellings, but the pressure of public disapproval has led the municipalities of these towns to discontinue their efforts in this direction.

Outside London, the block dwelling is to-day regarded as an undesirable method of housing. English workmen and their wives object to it as inconsistent with the English conception of a proper home. Even in London the block is not popular with the workmen, and that great city is still a city of small dwellings.

Scotland is the only part of Great Britain in which the block dwelling is extensively found, but the growth of quick means of transit and the advocacy of the garden-city idea are rapidly inducing Scotch builders to erect cottages instead of blocks in the new housing areas.

My experience of the administration of these Acts in Hull is that since 1898, 1,108 dwelling houses have been represented to the council as unfit for human habitation. Of these, 788 were demolished and their sites cleared; 99 were converted into warehouses; 18 into sheds; and 147 were structurally altered, repaired, and made reasonably habitable. The area of the sites of the houses condemned is about 8¾ acres, and many of the sites still remain unbuilt upon.

During the past year 1,279 dwelling-houses in the city of Hull have been inspected under the Housing, Town Planning, etc., Act. Of these, 710 were found to be defective, and the sanitary defects ordered to be remedied. 73 were found to be unfit for human habitation and were closed, 9 were converted into warehouses, 8 were demolished, and 56 remain closed pending demolition orders being passed.

Several hundred houses, many of which might have been represented as unfit, have been demolished in the carrying out of great street improvements undertaken by the Hull Corporation, whilst many others have been voluntarily demolished by the owners.

Whilst much good has been thus effected, much more remains to be done, and it is only by an enlargement of the policy pursued in the past, namely the closure of insanitary areas and building thereon dwellings according to modern requirements and suitable for the class of people who would be displaced, that the desired improvements can be made.

It is especially noted that when making our sanitary surveys many houses in some districts which might be condemned were occupied, and could scarcely be dealt with except under some formulated scheme

,which has for its furtherance a sanitary improvement. Many of these houses, however, are in the vicinity of the docks and industrial centres, where workmen are employed at early and late hours, and often throughout the night, and of necessity desire to live as near as possible to their work.

The carrying into effect of the Housing Acts in recent years has increased the number of houses let in lodgings in the city, and although by-laws have been made for their regulation to provide against overcrowding, still they do not limit the number of inhabitants living within a specified area.

There are in Hull some 362 houses registered under the by-laws, affording accommodation for 4,183 persons. A special inspector devotes the whole of his time to seeing that the by-laws relating thereto are carried out. The by-laws require that a room used for living and sleeping purposes shall have accommodation affording 500 cubic feet of free air space for each person over ten years of age, and 250 cubic feet for each person under the age of ten years. In rooms used exclusively for sleeping purposes, the by-laws require that 400 cubic feet of free air space shall be allowed for each person over ten years of age, and 200 cubic feet for each person under ten.

There is also a provision in the by-laws for sanitary conveniences, namely, one sanitary convenience for every twelve persons. Provision is also made for cleansing, periodical limewashing, etc., the notification of infectious diseases, and the proper drainage and flagging of courtyards.

In making representations to the committee under Part 2 of the Act, plans and photographs are prepared by the housing inspector, and are submitted, together with the medical officer of health's report, to the housing committee.

Specimens of such plans and photographs were presented to the meeting.

Housing of the Working Classes: Problems and their Solution, by P. Lloyd-Greame.

THE subject suggested to me for this paper is so wide that I cannot hope to cover the whole field which lies open for discussion.

Let me deal first with urban areas. The commonest problem is the existence of an area, or of particular houses which, through fault of construction, or want of light and air, or through some other sanitary defect, are unfit for human habitation. In such cases a local authority is faced with a double duty. It has to abolish the insanitary place; and it has to see that the working classes displaced by this abolition are able to find suitable accommodation. Apart from the question of finance, the local authority's power of abolition are adequate; its powers of re-housing, however, are insufficient, and are based on a wrong principle.

Where a local authority is willing to adopt an improvement or reconstruction scheme, the Act of 1890 contemplated that the rehousing of the working classes should take place at or near the area which had been cleared. That Act has been amended, and it is now possible for a local authority to acquire land for the erection of working class dwellings outside its own area, and to acquire more land than is actually required for its immediate purposes. But the local authority cannot acquire or use any land for the purpose of housing persons other than the working classes. This prohibition is socially and economically unsound. I need not labour the social objection. However inconsistent our performances may be with our principles, it has become an article of political faith in all parties, except perhaps the Socialist party, that class legislation and class segregation have had their day. It is idle to talk of a common life and to pass Acts to prevent it.

The economic objection is equally strong. The erection of purely working class houses is not highly remunerative. Private schemes for the development of garden suburbs cater principally for the middle class; not because the promoters of these schemes have any peculiar affection for that class, but because they pay. The housing activity of the local authorities ought, for the most part, to be directed to the development of housing schemes, outside the unhealthy areas which they have cleared, in healthy districts, which increased and cheapened travelling facilities make accessible, and in which the members of the community will have an opportunity of living that common life to the ideal of which they profess so deep a devotion.

Objection will probably be taken that these suggestions contemplate

local authorities becoming large land owners and undertaking building schemes for which they are unfitted. My answer is that twenty years ago Parliament decided that, if the working classes are to be decently housed, local authorities must supplement private enterprise. It is too late to go back on that now, even if reactionary critics desire to do so. The only course open to us is to give the local authorities the fullest opportunities of developing their building activities on sound social and economic lines. If it is felt that the direction and management of a large building scheme is beyond the powers of a local authority, I see no objection to the authority acquiring land, making a scheme for the development of that land for the housing of different classes of the community, and leaving the scheme so made to be worked out for them by a Company formed for that purpose, to which they could grant building and management leases and afford financial assistance.

It has been suggested that, whether or not further powers should be given to local authorities, the authorities have not made a sufficient use of their existing powers, and that they should be stimulated to further activity by the appointment of three peripatetic Commissioners. I am not greatly enamoured of this proposal. In so far as local authorities are slack in the administration of their duty they should of course be urged forward; but no improvement will be made by merely taking away their powers in particular cases and vesting these powers for the time being in a wandering expert. Local authorities will be made to act, not by the occasional visits of experts, but by the insistence of those to whom their members are directly responsible. Lasting improvement in the attitude of public bodies may be compelled from below: it will not be coerced from above. Many people are too ready to attack local authorities for slackness. There is a statutory obligation upon local authorities undertaking an improvement scheme to satisfy themselves of the sufficiency of their resources; and, whether or not that obligation in terms applies to other powers under the Housing Acts, it is a condition precedent to all action.

The reforms of rehousing at a distance from cleared areas and of including in their housing schemes more lucrative types of houses will make the financial path of the local authority easier. Again, excessive compensation is often paid in clearing a district or demolishing a house. This difficulty was contemplated when the Act of 1890 was passed, and the provisions of section 21 that compensation should be reduced where it was proved that the rental of the house was enhanced by reason of the improper uses to which it was put or its overcrowding or its insanitary state, were introduced to meet such a case. They have largely failed in

their purpose owing to the difficulty of proof and the unwillingness of arbitrators to admit comparative evidence. It will not be unreasonable to introduce a reform by which the onus of proof in the case of houses of this description should be shifted on to the owner who claims compensation.

But even with these reforms there will still remain cases where the local authority is not in a financial position to undertake the necessary housing reforms. In such cases the local authority ought to receive assistance from the Imperial Exchequer. If insurance is of such national importance that it demands the expenditure of the nation's money; if old age pensions, education, and even roads are to be paid for wholly or in part out of the national purse, surely the housing question has a legitimate claim on the State. If the powers and the financial provision of the local authorities of this country are sufficient, the authorities will not be found unwilling to discharge their duties. If, however, a lazy or recalcitrant authority should be found, I think that without having recourse to the three wise men suggested by the Housing of the Working Classes Bill of 1912, some weapon less rusty than the procedure by mandamus ought to be forged. It behoves me as a lawyer to speak with respect of this ancient form. But it is slow and cumbrous; and it is often ineffectual, because the only way of enforcing an order upon a local authority in the last resort is by the somewhat Gilbertian method of putting all its members in prison, a situation in which they might be more willing, but would hardly be more competent, to discharge their functions. A practical solution is provided by the Housing Bill at present before Parliament, which provides that whenever an order of the Local Government Board is enforceable by mandamus, the Court may authorise the Board to carry out the order, and may vest in the Board the powers of raising money for carrying out the order which the local authority would have had; at the same time providing that, if the Board is satisfied that the local authority will carry out the work, the Board shall have the power of retransferring the rights and property in question back to the local authority.

It may be convenient at this point to notice a problem which has certainly arisen in many parts of London, and I daresay in other large towns, namely, that serious overcrowding exists in many districts side by side with large numbers of empty houses. The explanation is simple. The landlord, by overcrowding, is enabled to obtain a large aggregate rental by charging the several tenants a comparatively low rent. The remedy is equally simple, and lies in the rigid enforcement of reasonable by-laws.

In the country districts the housing problem is simple and acute. In many places there is an actual dearth of houses. In others the houses are often in such an insanitary condition as to render them almost unfit for human habitation. It is hardly necessary to produce evidence of this to those who are acquainted with our country districts, and who know how specious is the charm of many a picturesque cottage. I may, however, quote from the reports of the medical officer of health and the sanitary inspector for the district with which I am best acquainted. Medical officers and sanitary inspectors are efficient men, not given to exaggeration, and these gentlemen are no exception in either respect. They say:—

> "The happiness, contentment, and working power of the family alike depend upon the domiciliary environment; and the improvement and perfection of this should be the object and ambition of every sanitary authority. No sanatorium for the treatment of consumption can in any way equal the power for good possessed by the well-built, well-equipped, and managed dwelling-house, for therein is found the means of so building up, fortifying and strengthening the individual unit, as to render it immune to the attacks of its insidious enemy. Equally effective is it against disease of the dietetic type, and equally whether we regard rheumatism and its allied troubles as proceeding from spores or general constitutional taint we find the dwellers in well-ordered and ventilated houses are less liable to attack, and better able to counteract the debilitating and crippling effect of these diseases.
>
> Many so-called 'houses' are wretched little two or three or four-roomed hovels built ages ago, and now quite worn out. Their sphere of usefulness is gone, and they should follow.
>
> There have been, during 1911, a good many houses built in the district, adding to the rateable value and to that extent beneficial, but only very few are of the kind required by the working-class, and it is chiefly of their needs that I am writing.
>
> There is the further question of the absolute lack of cottages. Enquiry which was made in the district, revealed that there is urgent need for further provision.
>
> The inspection shows that there are approximately 120 houses in the district at present inhabited which must be condemned, or which should be replaced by better, and coupled with this, is the pressing necessity for more accommodation.
>
> The council should endeavour to encourage or persuade private enterprise to supply the deficiency, or themselve exercise, if practicable, their powers under the Housing Acts."

Let us by all means stimulate and encourage private enterprise. The man who builds a row of unremunerative cottages, is not less a public benefactor than the man who builds a hospital. I should like to see such enterprise honoured as Pitt honoured those who planted and made fertile the Yorkshire wolds. But private enterprise is not enough. The rural district councils have, apart again from the question of finance, ample

powers to cope with both their housing problems. The powers of closing, demolition, and construction under the Housing Acts, together with the special powers under the Small Holdings and Allotments Act of 1908, are all that can be desired, but they are not exercised. It is sometimes suggested that the reason for this failure is to be found in the inertia and character of the rural district councils, and it is argued that the whole of their housing powers should be transferred to the county councils. There are strong reasons for advocating such a transfer. It was approved by the select committee on rural housing in 1906; it will avoid duplication; it will lessen cost; the county council is already obliged to appoint a public health and housing committee; the county council has power either on its own initiative, or with the consent of the Local Government Board, to exercise the powers of the rural district council, if such council is in default; it has powers of financing co-operative societies formed for the acquisition or improvement of working class dwellings; it exercises many powers in relation to small holdings. These arguments, and more besides, will be ranged in support of such a transfer, and it is a formidable array.

But there is a single argument on the other side, which, in my opinion, outweighs them all, namely, the undesirability and the practical inexpediency of taking away existing powers from a democratic body. And I am by no means satisfied that the default of the rural district councils is wilful. The crux of the question is finance. In many cases the rural district councils believed that, under the Housing and Town Planning Act, they would receive financial assistance in carrying out housing reform, and they were ready and eager with the help, which they thought would be given, to exercise their powers and pay their share. That power will have to be given. The arguments advanced in favour of grants in aid of improvement and reconstruction schemes, apply with at least equal force in the present case. I shall be told that the State-aided building of cottages which cannot be let at an economic rent is a dangerous policy and a subsidising of low wages. I do not wish to exaggerate the value of what may be called indirect returns on national expenditure; but such returns are very real. The cost of education is steadily increasing. The increased grants are not refused on the ground that the children, who are educated, will be unable to repay the cost of their education by yearly instalments. The same observations apply to State subsidies for National Insurance. A very large part of the sickness in agricultural districts is due to the state of the houses. Increased health and decreased pauperism would more than balance the actual deficit in uneconomic rent. I am even less impressed with the argument of subsidising low wages. I can think of

no reform, to which the State has contributed, against which this argument has not been urged. If any attempt should be made to reduce the labourers' wages in consideration of a State housing grant, there are obvious methods of defeating such an attempt.

Although I believe that the housing problem in country districts cannot be solved without a State grant, not a little may be done by re-enacting in the country the copartnership policy, which has met with such success in Ealing and Hampstead and other towns. I think that county councils will do well to use to the fullest extent their powers of affording financial assistance to such undertakings. I believe, too, that it is through the medium of copartnership societies alone that working men will be enabled to become the owners of their houses. The powers of State-aided purchase under the Small Holdings Acquisition Act, 1899, are practically a dead letter. It may be that persons have been willing to purchase their houses and have been unable to take advantage of the Act by their inability to find one-fifth of the purchase money. There is some evidence of a similar inability to make use of the State-aided purchase provisions of small holdings, which were contained in the Small Holdings Act, 1892, and re-enacted by the Small Holdings Act, 1908. But I am not aware of any direct evidence with regard to the Act of 1899, and in the absence of such evidence I do not think that any useful purpose would be served by amending that Act. The scheme provided by a copartnership housing undertaking is in many respects more practicable and more attractive. The initial cost is comparatively small. There is no duplication of the fees of lawyers or surveyors. The undertaking is soundly and economically managed, and the rate at which money can be borrowed correspondingly less. The purchaser instead of acquiring a house, the liability for the repair of which is uncertain and the possibility of selling which is often small, acquires an easily transferable share in a sound and solvent company.

It is well that these questions should be discussed; and I look forward to a time when the State shall regard the housing of its subjects among the first of its duties, and shall take and understand as its motto: *Stet fortuna domus.*

Councillor Twaddell (Belfast) thought that, generally speaking, they might justly saddle public representation with the responsibility of the existence of slum areas, especially in large cities. Those areas were brought about through laxity on the part of their representatives in the discharge of their public duty, by allowing houses of questionable quality to be erected by speculators, who had

no other desire than to cover the ground with houses of questionable quality intended for sale, in order to secure a profit rent on the ground upon which the houses were built; the result being that in a few years those houses became so dilapidated as to be unfit for habitation, and should therefore be condemned.

MR. S. H. DAVIES (York) urged the desirability of impressing Government with the necessity of grants for housing. The difference between, say, 3 per cent. and 6 per cent. gross return on capital was sufficient to solve many housing problems. Locally, the possibility of building a cottage with three bedrooms at a rent of 2s. 6d. instead of 5s. would provide a great incentive to an authority to rehouse present dwellers in slum areas.

COUNCILLOR W. T. CRESWELL (Carshalton) said the author appeared to advocate the clearing of all slum property, and not substituting dwellings for the people driven out. Further, the author would rather build on the outskirts of the town, and thus provide for the working classes. In his (Mr. Creswell's) opinion, in smaller towns working men's dwellings could be built on the outskirts, but in large towns and cities the effect would be to make into slums other buildings in the immediate neighbourhood of the areas from which the slum buildings had been removed; because a certain class of worker must live near his work. To build on the outskirts was simply enlarging their towns till they touched each other, and it was essential a belt of open country should be preserved round each town.

Unemployment and the Public Health, by B. Seebohm Rowntree, J.P.

WE may define unemployment as "the inability of persons who are seeking work for wages to find any suited to their capacities, and under conditions which are reasonable, judged by local standards." This definition rules out people who wish to work on their own account, persons temporarily ill or chronically infirm, and also those who, although they may nominally be looking for work, are by no means anxious to find it.

I do not attempt to show exactly the extent of unemployment, since the most competent statisticians have failed to arrive at a satisfactory basis of estimation. It will, however, be safe to assume that on the average for good years and bad, good seasons and bad, there are not less than 500,000 men involuntarily idle.

The Economic Loss.—Now this mass of unemployment, though we have become so accustomed to it that we often ignore it, must represent a serious drain on the resources and vitality of the nation. If we estimate that on the average the men are probably capable when in work of earning at least £1 per week, we arrive at £500,000 per week, or £26,000,000 a year, as the immediate loss in wages; and the sum thus named does not represent the total loss, because for every worker out of employment there is an equivalent in capital and land (or raw material) lying idle, yielding no profit to the owner. The indirect losses are even greater. Each period of unemployment, unless of very short duration, impairs the industrial efficiency of the worker, and his earning power. Often, to avoid starvation and the breaking up of their homes, men will accept inferior jobs, and in this way jeopardise both their industrial efficiency, on which perhaps many years of training have been spent, and their chance of rising again to their former position. Moreover the army of 500,000 is not composed of the same individuals day after day, but varies perpetually as men lose and find employment; and thus periods of reduced income, and often of acute want, affect a far greater number of families in the course of the year than would appear at first sight.

How far is Unemployment caused by Ill-health?—No figures on a national scale exist to enlighten us on this question. It is rarely possible to say in any particular case whether a man at present unable to find work, because physically handicapped, has been brought to this condition through hardship consequent upon past unemployment, or whether some physical or mental defect was connected with his losing his last job.

Two years ago, however, with the help of others, I made careful inquiries in York into the history of a large number of unemployed men; and, as far as we could ascertain, about 10 per cent. of the men who had within two years been in regular work were disqualified for recovering it by physical defects. Of these 10 per cent., 3 per cent. were also handicapped by faults of character, such as laziness and intemperance. Among the casual workers, nearly one-quarter of those out of work at the time of the enquiry were defective, 12½ per cent. only in physique, 11½ per cent. both in physique and character. Among men previously engaged in the building trades, more than one-fifth were physically defective, and two-thirds of these were also of poor character. However little weight we attach to statistics based upon judgment rather than fact, there can be no doubt that in a large proportion of cases physical handicaps, more or less severe, play an important part in the inability to secure work.

Among boys under 19 years of age we found many whose unemployment could be directly traced to ill-health and neglect. At school their teachers had generally predicted unsatisfactory industrial careers for them. Defects of eyesight, mental dulness (due sometimes to neglected adenoids, anæmia and general lassitude), bone diseases which might have been remedied at an earlier age, underfeeding at home; in short, a whole list of unfavourable conditions had been present in childhood.

It must not be thought, however, that those who are handicapped by ill-health or poor physique are therefore incapable of all work. If only a suitable occupation could be found the majority of them could be employed. As a matter of fact, we did not include in our survey those who were temporarily or permanently unable to support themselves, such as hopelessly crippled and deformed persons. The majority of those among the unemployed whom I have described as physically defective are merely not strong, *i.e.*, unable to undertake hard muscular work. With a well-developed national system of labour-registration, it might be possible to reserve certain kinds of light work for men and boys of this type, who are otherwise satisfactory. But their number could be greatly reduced if forethought were applied to the problem rather than after-thought. With proper preventive measures, the number of feeble, defective, and unhealthy persons among the workers could undoubtedly be considerably lessened.

Effect of Unemployment on Health.—We have already considered the immediate economic loss to the nation due to unemployment. But the indirect loss, affecting it through the lessened vitality of the people, is perhaps even more important. As evidence of the effect of unemployment

on the families concerned, Miss May Kendall has obtained for me a number of budgets of household income and expenditure, kept in each case for four weeks while the main breadwinner was out of work. Of eight families for which these particulars were obtained I found that the best fed had only two-thirds, and the worst fed not more than one-third of the nutriment necessary to maintain physical efficiency. The standard adopted is that of Professor Atwater, 125 grams of protein and 3,500 calories of energy value per man per day.

In the eight families, eighteen children were affected, and for the whole country the number of children thus handicapped by malnutrition from the very outset, subsequently to appear in our lists of unemployables, or physically defective, must be enormous.

The effect of malnutrition on tuberculosis is well known. This is a disease of poverty in so far as it seeks out those who are anæmic and weakly. The first thing a medical attendant does to arrest this disease is to prescribe blood- and flesh-forming food.

The lack of nourishing food is also a potent cause of infantile mortality. From ill-nourished mothers one cannot expect a generation of healthy children, especially if their chances are still further curtailed by the substitution of the bottle for the mother's too scanty supply of milk. Dr. Newman's book on Infantile Mortality is full of evidence on this point, and efforts are being made in York, as in many other towns, in connection with Infant Consultations, to save the children by the provision of nourishing food for nursing mothers.

As far as the unemployed person himself is concerned, a few days of starvation now and then would not be as injurious to him and to his chance of employment as is a long-continued period of malnutrition. Of the unemployed men in York who had been in regular employment, half were found to have been out of work for more than six months. Among the casual workers, short periods of comparative plenty alternate with periods of want, a condition under which no reasonable régime of diet can be expected.

And malnutrition is not the only source of evil in this connection. You will all know how difficult it is for the authorities to apply the whole rigour of the law in the matter of overcrowding, since the plea of unemployment so often makes it impossible for them to deal harshly with those who come before them for this offence. It has been observed, especially in London, that at times of trade depression, the lowest classes of labour become very migratory, because the labourer cannot afford to pay rents. But the consequent artificial increase in the demand for dwellings tends

to raise rents, thus leading to still further overcrowding. This difficulty emerges whenever the improvement of insanitary areas is contemplated, because it is impossible to rehouse the tenants in decent houses, the rent of which they can afford.

Moral Deterioration.—We are often apt to blame the poor for their want of thrift, their intemperance, and their neglect of parental duties. But do we always appreciate sufficiently the conditions underlying their lack of stamina and their moral indifference? I have been impressed, in my study of so many cases of unemployment in York, by the apparent irresistibility of the forces which make for moral deterioration. When the bodily strength has been undermined by malnutrition, when natural appetites can find no satisfaction, can we wonder that the will succumbs to the temptation of drink? Even when unemployment only lasts a short time, the haunting sense of not being needed is enough to upset a man's moral balance. The boy criminal is nearly always a boy out of work, and the petty thief who is sent back after a brief imprisonment to the same unhealthy environment often becomes an inveterate enemy of the law, because both his desire and his capacity for honest work have been gradually undermined. Or take the case of those who, after a short period of unemployment, have been compelled by poverty to undertake inferior work at worse wages. How soon their self-respect is undermined, and all their standards of comfort and even decency sink to a lower level.

In short, it is impossible to exaggerate the serious effects of unemployment on national health and character. While I cannot, in this paper, give a full statement of the problem and a complete list of desirable reforms, I may briefly outline some of the remedial measures which my study of the subject has more especially suggested.

Suggested Measures.—In the first place, it is of paramount importance that preventive measures should be taken before the industrial career has actually begun. Every effort to improve the health of school children, even to giving the babies a better chance, will reduce the risk of unemployment due to physical defects. What these measures should be is discussed, with more authority than I possess, in another section of this Congress. But I feel sure that however valuable the work of medical inspection, of school clinics, and of special classes and schools, the organisation of Care Committees in connection with the schools is also indispensable. Not only can the workers of Care Committees see to it that medical recommendations are carried out, but they can exercise a wholesome influence on the homes of the children which may gradually raise the tone of a neighbourhood. They can also see to it that all the circumstances of children

treated for physical defects are taken into account, and, as far as possible, improved wherever necessary. Where, however, homes absolutely refuse to co-operate, there should be greater readiness among magistrates to send the children to day or residential industrial schools. Such cases, of course, will always be exceptional. The help and encouragement given by a sympathetic and conscientious visitor will generally stimulate the parents to that renewed interest and care without which there can be no improvement.

Care Committees can also fulfil an important function in helping lads to choose their employment wisely at the very outset of their industrial careers. Even though the first employment may be exchanged for another, some supervision over its choice, and over subsequent decisions, is necessary to avoid the dangers of "blind-alley" occupations. The period of unemployment, often a prolonged one, to which the juvenile worker is liable, when he is too old to work at boys' wages but has learned no trade since he left school, may affect his whole life in the most disastrous manner.

I do not imagine, of course, that continuous employment throughout the years of adolescence, with an assured prospect of remunerative work later on, can be secured for every juvenile worker as our industrial conditions now stand. But it is possible to arrange that no boy should be idle for any length of time without proper supervision; in other words, that no lad below, let us say, the 19th year of age should be permitted to idle in the streets, or to support himself by occasional catch jobs.

Recently I have been elaborating a scheme for the compulsory daily attendance at continuation classes of all unemployed lads under 19 years of age. I cannot now enter into its details, but it includes the provision, when necessary, of a substantial meal a day for lads whom it prevents from accepting mere catch jobs. There is no industry of any consequence which depends on casual boy labour for its operations, and no serious hardship will thus be inflicted on any section of the community by its prohibition. At the training school the unemployed lad will gain in mental equipment, in manual dexterity, and, by the aid of graduated drill and gymnastic exercises, in physical strength. Thus, his inability to find regular work may be converted from a serious danger into a splendid opportunity of preparing for his industrial career, and reducing the risk of unemployment at a later age.

In dealing with the unemployment of adult men, I believe that much seasonal unemployment, and to some extent unemployment at times of trade depression, might be avoided if public authorities, national and local,

took care so to arrange their work that the maximum of employment given out by them coincided with the slack times of the prevalent industries.

Next, to prevent the terrible physical and moral deterioration arising from casual labour, a determined effort should be made to lessen as far as possible the number of men employed irregularly. In many industries, such as the building trades, such casual employment seems the unavoidable result of the conditions under which the men work. But I could give many instances of cases where the full employment of a few regular men could easily be substituted for the occasional employment of a larger number. Labour Exchanges, if universally made use of, could reduce the evils of casual labour to a minimum.

My next suggestion is one which has been before the public for some time, namely, the afforestation of vacant lands on a great scale during times of trade depression. The Royal Commission on Afforestation and Coast Erosion, a few years ago, reported that there are, in Great Britain, about 8½ million acres of land suitable for afforestation, which now return little or nothing. If this area were planted, work could be found immediately for over 50,000 men, and eventually for nearly 200,000 for four months each winter, in addition to a permanent staff of over 20,000. The numbers employed could be regulated according to the state of industry, since much of the planting, and later on, much of the felling, could be reserved for periods of wide-spread unemployment.

Lastly, in thinking of the great number of men who, in spite of all the measures which I have named for the prevention of unemployment, as well as more drastic economic changes, will still grow old and become partially disabled, will still have to stand aside during frost and rain, will still be subject to fluctuations in fashion or changes in the methods of production, I advocate another measure which should help families to tide over periods of unemployment without hardship and without physical and moral deterioration. Insurance against the risk of unemployment, while good so far as it goes, cannot possibly cover all these cases. A seasonal unemployment, for instance, recurring for a considerable length of time year after year, does not constitute an insurable risk, except in so far as the wages earned during the seasons of activity may be sufficient to pay for more than the immediate wants of the household. And, as a matter of fact, it is among the seasonal and casual labourers that wages are among the very lowest. Yet it is the worst possible economy for a nation to allow its workers to deteriorate. It is fatal financially, industrially, and from the standpoint of the public health. A manufacturer who allowed his machinery to deteriorate while

temporarily out of use, would be considered a very bad business man. A scheme, therefore, is required for keeping labour in a state of efficiency, ready for immediate use, during those weeks or months in which it is not needed. Such a scheme I have found in operation in Belgium, where vast numbers of the workers employed in towns reside in the country, cultivate their own plot of land, and bring up their families in fresh air and wholesome environment. The more I have studied this state of things in Belgium, the more I have become convinced that it lessens not only the evils arising from unemployment, but also its occurrence, and that its benefits in other directions also are far-reaching. Suppose, for the sake of argument, that by a great extension of the small holdings movement, and by the provision of adequate transit facilities, we could reverse the proportion of workers residing in town and country in England, *i.e.*, have three-quarters of the population living in rural districts instead of one-quarter, as at present. House-rent would be substantially lower, and, for the same rent he now pays, the worker could occupy a good-sized garden or allotment as well as reside in a better house and pay for the moderate cost of travelling to and from his work. In this country, compared with Belgium, we do not yet know what cheap fares for working men mean.

All the gardens would be of economic value, though in varying degree. The average net proceeds from twenty-four industrial workers' allotments in York, carefully worked out for three years, amounted to £31 per acre. This includes the work of novices, and, with better facilities for horticultural training and practice extending over more than one generation, the average might well reach £50 per acre, a figure exceeded by many of the York allotment-holders; so that, if we plan as many as twelve allotments per acre, the proceeds from each would attain a value exceeding £4 per year. If we give to each family a quarter of an acre, we could reckon an annual addition to their income of £12 10s., or about 5s. per week. This addition would only partly, if at all, come in the form of money, but would represent a most desirable supply of vegetables and fruit, of potatoes and perhaps bacon and eggs and cow's or goat's milk. The less perishable of these commodities just furnish that little reserve of wealth which tides over temporary difficulties; they provide an insurance against the risk of unemployment, the amount of which depends on the man's own industry, and which leaves out of account the reasons why he left work, or why he cannot find fresh employment. While the man was in regular work he would cultivate his plot on Saturdays and holidays, with considerable help in the lighter work from his wife and children, and such minor exertion

as he could give on week-day evenings. When he falls out of employment he can either bestow more work upon his own piece of land, or find odd jobs among the farmers of the neighbourhood and his neighbours of his own class. Thus, instead of walking aimlessly from gate to gate, or from dock to dock, or sitting for hours in the waiting-room of a Labour Exchange, he can keep himself in physical vigour and retain his self-respect.

It has lately been said, by several authorities on agricultural development in this country, that nothing could more surely and more rapidly revive the somewhat sluggish life of our agricultural districts, and stop the migration of rural labourers to the towns, as the influx into the villages of a large number of men who work in the towns and return at night. Thus the benefit would be mutual. Rural England would once more flourish and take a fresh lease of life, while the slums of the town would be dispersed, and with them the conditions predisposing to unemployment.

ALDERMAN J. P. HURRY (West Ham) said that the working in conjunction of the labour exchanges with the committees of the choice of employment should tend to improve the condition of boys and girls just leaving school, making it possible for them to take up the trade they were most suitable for; and also to the care of them during the time they were waiting for a situation. The general body of casual labourers needed some special treatment. They were usually classed by the people who knew no better as "won't works," but he was quite confident that, given the opportunity, they would become quite as good citizens as any other people.

COUNCILLOR DAVID WILLIAMS (Swansea) said unemployment was a cause rather than the effect of physical, moral, and mental deterioration. The present method of production demanded that there should be a margin of unemployed persons: first, because, in the engineering and shipbuilding industries, particularly as regards repairs, the nature of the work made it impossible to determine at any time the number of men required to deal with the work. The same applied to most other seasonal trades, and therefore, so long as the system demanded that this should be so, there should be national responsibility.

COUNCILLOR BROGAN (Battersea) thought that Mr. Rowntree should include the feeding of delicate children, and that the Government should be asked to pass a bill compelling local bodies to supply milk to delicate children at a very nominal cost. Mr. Rowntree said that it was almost an impossibility for the

children of the slums to rise, but be could point to a York slum, where he was born, in Walmgate, and to-day there were three London schoolmasters, two mistresses, two managers, two foremen, one highly-salaried civil servant, and one Battersea borough councillor who were among the children brought up there. They were the descendants of the men and women driven from Ireland by the famine, but the old blood had asserted itself, and in spite of their surroundings they had risen again in the world, and had grown up strong and healthy citizens.

Alderman Joseph C. Julyan (Poole) said that in considering this subject they wanted to ascertain the causes of unemployment and the remedies. He believed one of the causes of unemployment to be found in the fact that lads did not properly learn their trades, owing to the decay of the apprenticeship system. Large numbers, as soon as they knew or thought they knew enough to get through, left with a view of earning more money, and soon found themselves stranded through incompetence. Mr. Rowntree advocated drill, etc., for lads up to 19 years of age. He would go further, and support the objects of the National Service League. This would insure medical inspection of all lads at 18, and there could be no two opinions as to the value of such an inspection and training on the lads themselves. He also thought some of the money at present wasted on education might be used to give boys and girls manual training in the schools to a much larger extent than at present. In order to deal with the defects found in school children as the result of medical inspection, much larger support should be given in the shape of grants by the Exchequer, as without this the treatment required could not be obtained. It would have been much better had the Government followed up and perfected this work before embarking on the national insurance scheme.

The Necessity for the Compulsory Abolition of Private Slaughter-houses in Towns by Act of Parliament, by COUNCILLOR J. M. HOGGE, M.A., M.P.

PUBLIC attention has again been concentrated on the necessity of keeping a vigilant eye on the public supply of meat, and a discussion of the further powers required to bring all meat directly under public oversight is therefore very timely.

The title of this paper raises the vital question and brings us face to face with the issue, dispensing with useless preliminaries. For it is commonly agreed that public authorities must have power to close all private slaughter-houses if municipal slaughter-houses are to be successful. It is obvious that if a system can be presented to a local council with a water-tight scheme of finance, it is much more likely to be agreed to than if it is presented on the ground of achieving a wise sanitary reform calculable only in terms of improved health, etc. Communities can reason easily in practical and evident figures, they fail lamentably to appreciate the larger issues.

What, briefly, is the case for municipal slaughter-houses? The most obvious public need is to secure a purer meat supply. To obtain this it surely is self-evident that an abattoir provides the best opportunity of inspecting all meat at the time of slaughtering, of inspecting the internal organs, and of receiving the seal of a competent meat inspector.

The opportunity of securing these things is made possible by the superior arrangements that can be secured at an abattoir compared with a private slaughter-house. Succinctly put, it may be stated thus: "The methods of slaughtering and the general conditions of the municipal abattoir are considerably superior to those of the private slaughter-houses. In the municipal abattoir slaughtering is carried on under observation, and is more accessible for inspection. Our municipal abattoir is scientifically conducted and replete with every convenience, while most of the private slaughter-house buildings have only been adapted to their present use, and are, therefore, inferior in construction and arrangement."*

The most desired result is an improvement in public health. Most local authorities refuse to license new private slaughter-houses, and consequently however many retail shops may be opened the existing slaughter-houses must supply the growing needs of fresh slaughtering. The

---

* Town Clerk, Huddersfield.

public have to rely entirely on inspection, and so far as I have been able to ascertain this amounts on an average to one visit in three weeks to each house, a very perfunctory system of protecting the public interest.

Incidentally one may also remark that the humane slaughtering of animals is also involved. No one alleges that systematic cruelty is practised, but it is at any rate true that the conditions under which animals are slaughtered in private houses lend themselves to cruelties that can be avoided in an abattoir. Indeed, in the report of the special committee appointed by the Admiralty to consider the humane slaughtering of animals presented to Parliament eight years ago, the opinion is strongly expressed that a municipal slaughter-house is highly desirable for the prevention of cruelty. "However humane and scientific in theory," it says, "may be the methods of slaughter, it is inevitable that abuse and cruelty may result in practice unless there is a proper system of official supervision. This can only be satisfactorily effected in public abattoirs, which it is hoped will eventually become the only legal places of slaughter."

It may be convenient to set out for discussion the arguments for and against the erection of municipal abattoirs. What, firstly, are the objections to the present system?

1. Existing private slaughter-houses are usually unfitted structurally for use as such and frequently are of such a nature that it is impossible to maintain them in a clean and sanitary condition.
2. They frequently are situated in close proximity to dwelling houses, and so create nuisances to the surrounding houses.
3. The retention of animals in lairage is obviously a great nuisance to people in the immediate neighbourhood, as is also the means of getting animals into awkwardly situated buildings.
4. All offal stored and collected, for however short a space of time, is bound to be a nuisance, especially at certain times of the year. This nuisance is enhanced when such offal is carted away.
5. It is not altogether uncommon for offal and blood to find its way into sewers.
6. It is not uncommon for the receptacles in use for blood and offal to be kept in a filthy state.
7. The insufficient space afforded for handling and storing meat is a serious drawback to private slaughter-houses.
8. The pavement and walls are often of such a character that they cannot easily be kept clean.
9. It is a very objectionable practice to have meat hung close to where offal and manure are left lying on the floor.

10. Children can readily find access to the door of such houses and watch animals being slaughtered.

11. Adequate inspection is very costly.

This cumulative list of objections seems in itself sufficient condemnation, but whether they are admitted or not the retail butcher meets them with other arguments usually of two classes, viz., the argument of personal convenience and the economic argument. In the first class he urges that

1. It is convenient to have his slaughter-house within reach of his shop. He asserts that to carry the meat from an abattoir means loss to its appearance.

2. It invades the privacy of his business and reveals the amount and nature of his trade.

3. It places him under an objectionable form of inspection, and

4. It may deprive him of a vested interest without compensation.

In the second line of defence the butcher places these economic arguments:—

1. The sale of foreign meat is stimulated.
2. The price of meat is raised to the poor.
3. The provision of an abattoir increases local rates.

I think I have stated the case fairly on both sides.

Let us now examine the arguments against the provision of municipal slaughter-houses. The question of the loss in appearance is more apparent than real. It is the misfortune obviously of every butcher who to-day is compelled to slaughter in another butcher's slaughterhouse. If it is a misfortune it affects all the butchers in many of our great towns where I cannot say the effect is noticeable. Moreover, it can be overcome by the provision of up-to-date vans so constructed as to carry the carcases swung from the roof.

The objection about his business cannot be a serious one as the nature of his business is common property now. It does not require exceptional acumen to observe which butcher does good business and which bad or indifferent.

To object to a closer surveillance is to claim for one branch of our food supply an immunity which is alien to the public interest and ought not to be entertained.

To be afraid of expropriation is to misread the generosity of public opinion which seldom fails to insist on justice being evenly handed out to all those deprived of any material right or privilege.

The economic arguments have, at a first glance, more weight, but on examination, they will be seen to grow visibly lighter. That abattoirs

will injure British agricultural interests is entirely fallacious, and indeed is unsupported by any known facts. On the contrary, that foreign meat is now inspected may actually depreciate home-grown meat, once the public appreciate this fact.

The increase in the sale of foreign meat is due to economic causes, and economic causes only. Foreign meat is cheaper than home-fed meat, and is therefore within reach of a wider circle of customers.

So far from this argument being material, it might be usefully and truly argued that the mere fact that all meat came from an abattoir would bring about an increase in the sale of home-fed meat. The average customer is not sufficiently alert to discern between the two kinds, but he could be in no doubt if home-fed meat were officially examined.

Nor is the argument that prices would rise borne out by facts. Any inquiries made in towns that possess abattoirs fail to confirm this statement. Indeed, the very opposite must ultimately be the case, unless it be untrue that amalgamation tends to decrease cost of production.

There is probably more substance in the third argument, although it would be difficult to make out a case for such a claim. It certainly would be easy to name a considerable list of towns where the municipal slaughter-houses pay, and even where they do not it is surely fair to reckon certain benefits, as in the case of sewerage schemes, on the profit side of the account.

There emerges then from this argument three clear conclusions in favour of the establishment of municipal abattoirs:—

1. *Humanity.* Animals would be protected from unnecessary suffering, both while being driven through the streets and while being laired or killed. The sights and sounds of slaughtering would be removed from populous neighbourhoods.
2. *Health.* Nuisances would be removed from the neighbourhood of dwelling-houses; meat supplies would be protected from foul emanations, and more thoroughly and systematically inspected.
3. *Economy.* Properly managed it is fair to assume that a profit could at least be made on working expenses.

To achieve this, local authorities must, however, be furnished with greater powers than they now possess. They must be able to close private slaughter-houses. Each town could do this now by promoting a private Bill, but, as is well known, this is a very costly method of procuring legislation. The power to erect municipal slaughter-houses is already possessed, and obviously, therefore, the one power required is that

to compel the closing of private slaughter-houses. It is the natural complement of the existing powers, and ought to be pressed for by the united strength of all local bodies.

It may be urged that local authorities should proceed under their existing powers to erect abattoirs, in the hope that public opinion would compel all butchers to use them. This could only be done profitably in towns such as York, where forty butchers use existing slaughter-houses in addition to the seventy-two who themselves possess such houses.

To build on a small scale, with provision for extension, would be useful as an experiment, and might compel others to come in, but experience proves that it is financially disastrous to run a fully equipped abattoir where there are private slaughter-houses; and the ratepayer does not often rise above considerations of that kind.

In seeking to obtain power to close compulsorily, probably the most important preliminary consideration is that of compensation. It must be faced, and presumably it must be admitted that at any rate certain houses have old rights which must be recognised. At the same time it is well to remember that the public do not enter on the combat unarmed. If the compensation were unreasonable, it is at any rate useful to remind the butcher that the prices charged at the abattoir must bear some relation to the capital sum the change would entail. It might even be possible to arrange for a sliding scale of prices according to the compensation claimed by individual tradesmen. One does not make those suggestions by way of threat, but only to encourage public opinion to face the situation.

There are other powers that must be sought for at the same time as we secure the power to abolish. The end of an abattoir might easily be circumvented if animals killed outside a borough could be sold without inspection at the abattoir. The abattoir would, therefore, require to be the clearing-house for all meat sold within the borough. This was found to be a real difficulty in Cardiff, where in 1906 it was stated that the falling off in the number of cattle slaughtered at the municipal abattoirs was due to cattle being slaughtered outside and brought into the city to be sold.

I have refrained from pressing other features connected with abattoirs, such as the provision for dealing with waste products, in order not to appear to be building up a fancy case. Rather have I sought to concentrate attention on the conclusions to be drawn from an impartial study of the arguments on both sides, which are to form the basis of discussion. These conclusions are that before it is advisable to proceed with a scheme for a municipal slaughter-house it is necessary:

1. To secure powers to close all private slaughter-houses;
2. To secure powers to ensure that all meat killed outside and brought into the borough shall, before being exposed for sale, be passed through the abattoir; and
3. To save unnecessary expense there must be combination among local authorities to secure legislation which will enable them to provide municipal slaughter-houses.

Along such lines simplicity of method and real sanitary reforms can be secured, with a certain prospect of financial success. It is a public and a national duty, and one can only hope that before long combined action will secure the opening up universally of yet one other road to public health.

Dr. John Robertson (Birmingham) said that within recent years he had not heard the arguments for and against the abolition of private slaughter-houses better put. General action was necessary, and in any legislation some lines should be set out as the basis of compensation. It was advisable in the first instance to set some time limit, such as five or ten years. This would enable local authorities to make the necessary provision, and at the same time help the trade to adapt itself and lessen compensation.

Mr. John Peers (Wolverhampton) referred to the decrease of private slaughter-houses in Wolverhampton without any undue hardship being imposed on butchers; particularly in cases where private slaughter-houses were situate some distance from the butcher's premises. He also emphasised the growing danger of certain tradesmen removing beyond the borough boundary in consequence of the supervision within the district. Further, he urged the desirability of restricting the times of slaughtering, so as to prevent night work and Sunday work, except under special circumstances, and only after the giving of notice.

Dr. J. H. Garrett (Cheltenham) said it was not so difficult as had been represented to get powers for closing private slaughter-houses. In Cheltenham powers were obtained 17 years ago (Provisional Order to close all private slaughter-houses), giving compensation to both owner and occupier. Notwithstanding this, it had been found impossible to get rid of the private places, on account of the great cost to the public in respect of compensation. Whilst agreeing that compensation should be given to the butcher (and this could be arranged by giving free use of the public abattoir for a given time), the crux lay with the compensation claimed by the owner, which was always exorbitant,

and for which there appeared to be no just base. It frequently happened that the slaughter-house had not been built for the purpose, being only a converted hovel or barn, and it was absurd to place upon a building an artificial value because of its having been unsuitably turned to this use. In one instance in Cheltenham where an effort was being made to close a slaughter-house, the owner claimed a sum equivalent to six times the purchase value of the whole premises as estimated by an independent estate agent.

At the present time the propositions of public health were met in the councils by the marked desire to keep down the rates, and the fact of many thousands of pounds being required in compensation to close the private slaughter-houses in Cheltenham barred the operation of the Provisional Order. The irregularities existing in provisions of by-laws and general powers as between urban and rural districts necessitated general powers being obtained by Act of Parliament, and the private slaughter-houses were likely to continue until those powers were obtained.

MR. R. LAMBIE (Lanark C.C.) said that in Scotland licenses for private slaughter-houses came up for renewal each year, and in Lanarkshire were granted or refused as was thought fit. In Lanarkshire public abattoirs had been erected for most of the populous places, and he claimed that their system of meat inspection was as good as that of any burgh authority. As representing a county local authority, he strongly resented any proposal that meat brought into a burgh from a county district should have to pass through the burgh slaughter-house. The counties were as able to look after the inspection of meat as the burghs, and it was nothing short of an insult to subject one authority to the supervision of another in the manner that had been suggested. What they required was a universal standardisation of meat inspection.

Referring to the question of compensation, what compensation should be paid for he (Mr. Lambie) did not know. The conditions in which private slaughter-houses were kept meant nothing less than that those places were nuisances, and why should they pay compensation for the removal of nuisances? They should get rid of any such idea, and unite in one common purpose to secure a uniform standard for all meat throughout the kingdom. The time was ripe for it; it had already been strongly urged in Scotland; and he hoped some serious effort would go out from that meeting to bring about this much needed reform.

COUNCILLOR C. G. YATES (Brighton) said they had both an abattoir and private slaughter-houses. The licensed houses were very hard to displace, and the abattoir cost the town just over £1,000 per annum, including loan charges. About half the animals were slaughtered there. The inspection was very carefully carried out, not only in the slaughter-houses, but also in the shops. So

close a watch was kept on meat sold in the shops that butchers knew that they would gain nothing by establishing slaughter-houses just outside the borough boundaries.

MR. GEO. H. ANDERSON (Middlesbrough) said that whilst England led the way in almost all sanitary matters, she lagged behind in the inspection of meat. Almost every continental town had its well-equipped municipal abattoir, where all cattle intended for human consumption were slaughtered under direct control; yet in this country food was frequently prepared in ill-ventilated, unsuitable private slaughter-houses that would not be tolerated in any other country. It had been erroneously stated that a large number of those ill-conditioned buildings had been licensed for the purpose for which they were used, but that was not so; for prior to the passing of the Public Health Act, 1875, all buildings used as private slaughter-houses had to be taken over and registered, and he did not know of any local authority that had granted licenses to such buildings. He knew of many that had seized every legitimate opportunity that had offered to reduce their number. Under the present conditions it was absolutely impossible to have a perfect system of meat inspection in towns in which a large number of private slaughter-houses existed. Unprincipled butchers would naturally slaughter late at night, early in the morning, or at a time when the inspector was least likely to call. In a municipal abattoir that state of affairs would be impossible, for all animals slaughtered would be inspected. What was required was that all towns should have a public abattoir, and abolish all private slaughter-houses. Might they hope that Mr. Hogge, as a member of Parliament, would use his influence with the members of that great assembly, and endeavour to get the law so amended that complete and efficient meat inspection might be possible.

COUNCILLOR W. T. CRESWELL (Carshalton) said the author stated that to make the abolition of private slaughter-houses possible and public slaughter-houses a financial success, private ones must be done away with and compensation given. Why compensate anyone for being compelled to do away with what were in many cases mere hovels; which existed, in fact, against the interests of the health of the whole community? Had other interests been specially considered for compensation by the legislature in recent years? Look at the loss inflicted on the licensed victuallers' trade when little or no compensation had been given, though large license duties were paid in these cases. It would suffice that special facilities should be given to owners of private slaughter-houses to induce them to use public ones that might be provided. No other consideration as compensation was necessary.

CONFERENCE III.—ENGINEERS AND SURVEYORS.

Presidential Address, by A. D. GREATOREX, M.Inst.C.E., Borough Engineer and Surveyor, West Bromwich (FELLOW), President of the Conference.

WE might with advantage review the position and character of sanitary science and practice in the light of present-day experience, and see if we could extract any useful lesson which would assist us to solve some of the many problems in sanitary knowledge still awaiting solution.

Nearly all great changes are brought about by one of two causes, revolution or evolution, be they either physical, political, social, or economical, and the change in sanitary practice is no exception to that well-known law.

Improvement in health is a personal matter to each of us, for we have all a keen interest in living as long as we can. But life, unless accompanied by health and vigour, would be a burden rather than a blessing. Moreover, this conservation of health and vigour is now, and will be still more so in the future, in our hands; therefore a responsibility is placed upon us of no mean dimensions, and I think you will agree that it is to our interests to demonstrate our knowledge and skill in the science and practice of our profession, so that the public repose confidence in us and trust us to provide for them immunity from the many dangers and diseases incidental to our social and industrial conditions.

To appreciate to some extent the advance in sanitary science and practice we enjoy, beyond that ever dreamed of by our ancestors, it is desirable to compare the past with the present, and to deduce therefrom in what direction we may hope and expect improvements and reform in sanitary science and practice in the near future.

The process of development from the open drain to the socketed, highly-glazed, non-porous, water tested, disconnected, and ventilated drain of the cottage to-day is little short of a revolution. Vast as the improvements have been, we are still far from perfection in this particular branch of our profession.

In the matter of sanitary conveniences the development from the pail to the fully developed, modern pedestal water-closet in extent and magnitude amounts to a revolution, but the changes have been, if slow, the surer and safer process of evolution. Perfection, however, in this

appliance has not yet been attained, and greater changes will be called for in the not far-off future.

In the matter of sanitary appliances, the later tendency has been in the direction of simplicity and cleanliness, the florid designs and decorations upon which have given place to the severely plain and simple, they being more easily kept clean, and therefore free from the baneful attacks of malevolent microbes, which, according to our scientific teachers, exist in millions in the very dust resting thereon.

The domestic bath is now considered essential to all self-respecting citizens; even so late as the middle of the nineteenth century, fixed domestic baths were a rarity in the residences of the aristocracy, and in the houses of the peasantry were unknown.

That evolution has influenced the character and scope of domestic baths is patent to all of us, and you can readily appreciate the extent to which the use of the bath is now utilized.

This, however, has been mainly influenced by the facilities to easily obtain a plentiful supply of hot and cold water, and the introduction of a constant water service has made the bath both popular and beneficial.

It is many hundreds of years since our ancestors began to turn their domestic refuse into the flowing rivers. That the baneful practice is still in operation we have ample evidence in the present filthy condition of the rivers passing through many important towns.

A generation has gone by since the force of public opinion was directed to the danger of public health by the pollution of rivers and water-courses of this country, and Parliament in its wisdom made it unlawful to so dispose of either animal or vegetable refuse. This law is still most flagrantly evaded. How it is evaded we will not stop to enquire.

The Rivers Pollution Prevention Act, 1876, prohibits the passage of sewage into streams, and enacts that it shall be an offence to continue the pollution.

The pollution of rivers is now mainly due to manufacturing refuse, which can be, to a very great extent, avoided by previous treatment of the refuse without involving an unreasonable cost to those who cause the pollution. As regards the standard of purity to be attained before discharging a liquid into a river, it is difficult to arrive at an agreement that will apply fairly to all rivers.

A distinct advance was made by the passing of the Local Government Act of 1888, which gives county councils power to enforce the Rivers Pollution Prevention Act, 1876, and which enables the Local Government Board to issue provisional orders to form joint committees representing

interests affected, and investing them with the powers of the Rivers Pollution Prevention Act, 1876, to deal with any river or part of it.

Under the powers conferred by Section 14 of the Act of 1888, the Mersey and Irwell Joint Committee was constituted in 1891, and a similar board was formed for the whole of the rivers in the West Riding of Yorkshire.

In 1893 an important amendment was enacted in explanation of Section 3 of the Rivers Pollution Prevention Act.

The Mersey and Irwell Joint Committee obtained an Act in 1892, which gave them a simpler form of procedure than under the Act of 1876, and conferred on them the power to fix a specific time within which sewage disposal works should be undertaken. In 1894, the conservancy board for the West Riding of Yorkshire obtained an almost similar Act.

This legislation indicates the course that can be adopted in other places with a view to speedily cure the long-felt evils of the pollution of streams and rivers, not only by sewage, but by manufacturing refuse, the admission of which in an unpurified state into rivers often greatly increases the difficulty of dealing with sewage at outfall works.

Some towns compel manufacturers to treat their waste water before it leaves their works, and this should become more the rule.

No efforts should be relaxed to prevent the streams from being employed as vehicles for carrying off sewage or manufacturing refuse, and a high standard of purity should be maintained, both from a sanitary and æsthetic point of view.

The researches of science demonstrate that sewage can be made practically innocuous, and until it fulfils this condition it should be prohibited from being put into any river or public watercourse, and any infringement of the law in this respect should be strongly dealt with.

The importance attaching to the efficient disposal of sewage cannot be over-estimated, and its suitable treatment has played for many years an all-important part in public health matters.

The early attempts of dealing with water-carried sewage were in the direction of sewage farms and land irrigation. Then followed purification by precipitation with the aid of various chemicals and other processes too numerous to mention.

The sludge derived from chemical precipitation processes used to be regarded as a source of wealth, and much attention was bestowed on the subject by those who hoped to obtain the theoretical value of the fertilising ingredients contained in it; but these anticipations have not been realised. The practical conclusion is that sludge has no recognised value to justify

its being regarded other than as a product to be got rid of in the simplest and cheapest way. No doubt in time science will establish a better and simpler way of dealing with this troublesome question.

The biological treatment of sewage in properly constructed bacteria beds has been a triumph of latter-day science; but he would be a bold man who declared we had reached in this respect the pinnacle of perfection.

If a town is situated close to the sea it is sometimes considered to be in a more advantageous position than inland towns respecting the disposal of sewage, as this only has to be discharged into the sea. That is not a safe assumption, as the experience of many watering places proves, and I am of opinion that in time it will be found not only an advantage, but a necessity, for the sewage of many of our seaside towns being dealt with inland, and only the effluent being discharged into the sea.

In the early days of our history the sanitary laws were very few, and did not provide for the scattered population of the country. As civilization advanced and populations increased it became necessary that special legislation should be resorted to for the supply of greater powers for improving the external conditions of towns and otherwise for the public good, but no general measure was provided for the public until the year 1845. In 1848 a Public Health Act was passed, the important provision of which was the establishment of the General Board of Health. Experience showed that this Act required amendment, and the Local Government Act was passed in 1858. This Act enlarged the powers conferred by the 1848 Act, but was further amended by the Amendment Act of 1861.

In 1866 a sanitary Act was passed to amend and improve the law relating to public health. In 1868, two years later, a further Act was passed, which made further extensions of the powers contained in the earlier Act, and this was followed in 1869 by the Sanitary Loans Act, the Sanitary Act of 1870, and the Amendment Act of 1874.

In 1875 the Public Health Act was passed, and this can justly be considered the magna charta of our health, and to those who brought it about our best thanks are due.

The main purpose of the Act of 1872 was the re-organisation of the local authorities, and it did not attempt to codify or consolidate the law relating to public health; this was accomplished by the Act of 1875, which was a complete code of the existing sanitary law of England, and is so well known that it is unnecessary to describe it in detail.

Since its passing, however, the law relating to sanitation has been considerably extended and modified.

Has not the time arrived when a new and thoroughly up-to-date public health Act should be placed on the statute book in place of the many and various Acts and amendments?

Much has been done in the past through the agencies of the powers conferred by the various Acts of Parliament referred to, the energy and ability of the personnel of the various councils who consider them, and the officials upon whom devolves the duty of administering them. Still much remains to be done if the homes of the people of this country are to be brighter, if disease is to be swept away, and prosperity to become the keynote of the nation.

At the first conference of engineers and surveyors, held in 1892, Mr H. Percy Boulnois, who presided, exhibited a diagram of the six principal branches of municipal engineering, divided into the various sub-branches, under which the work of a municipal engineer is carried out. Since then, consider what changes and advances have been made in many of the branches of engineering, and the great and varied duties placed upon that official by Acts and other regulations. Has the same advance been made as regards his status and official recognition by not only the local authorities, but the public whom he serves?

So long as party strife continues in our municipal affairs it is hopeless to attempt to get the best results.

At the same time no person should hold an appointment unless he is fully qualified and competent to fulfil the duties, no matter how small or unimportant the district may be, for the village of this decade may be the important town of the next, and a neglected district in these days of inter-communication, without efficient official equipment, may be a source of danger to larger districts, or even to the nation at large.

We, in this country, are responsible for the welfare and prosperity of nearly one-third of the human race. We are also responsible to posterity to improve the physical condition of the people of our country, whereby the race may be enlightened and improved, and thus be fitted to govern this great empire.

Individually, we perhaps cannot do much, yet each of us can, in our humble way, contribute our mite to the common stock of human happiness, progress, and prosperity, and so leave to our sons, and their sons, examples of sanitary practice which will contribute to the health of this great nation.

Housing and Town Planning Progress, by H. GILBERT WHYATT, M.Inst.C.E., Boro' Engineer and Surveyor, Grimsby (MEMBER).

THE Housing, Town Planning, etc., Act, 1909, received the Royal assent on 3rd December, 1909, and has now been in force two-and-a-half years; but no progress could be made until the Local Government Board published their code of Regulations under the Act, on 3rd May, 1910.

The Regulations at first reading appeared to be unnecessarily complicated, and seemed to require in the earlier stages a large amount of work, which might with some advantage be postponed to a later stage; they also made no provision for the case where the local authority prepared the scheme and the landowner was in entire agreement with the proposals and needed no compulsion in the matter. The Regulations, however, included one to the effect that the Local Government Board might suspend any of their requirements, and the test of time has shewn that the Regulations are not so unworkable and formidable as they at first sight appeared to be. A White Paper was laid before the House of Commons, in November, 1911, shewing the then position of town planning in seventy towns, urban or rural districts, and letters from the Comptroller of the Housing and Town Planning Department of the Local Government Board, shew the advance from the date of that Memorandum to the present time:—

	At Nov., 1911.	At May 31st, 1912.	At July 21st, 1912.
Schemes finally made by local authorities and submitted for the Board's approval	—	—	1
Authority given for the preparation of schemes	8 Schemes by 7 local authorities	14 Schemes by 11 local authorities	14 Schemes by 12 local authorities
Applications for authority	2	7 Schemes by 6 local authorities	7 Schemes by 6 local authorities
Local Authorities which have taken the first steps, and have served the necessary notices	11	13	13
Authorities which have schemes under consideration	22	31	32
Authorities which are in touch with the Local Government Board in the matter	28	36	44

Since the promulgation of the Regulations under the Act in May, 1910, many conferences have been held, and many papers have been read

before various learned societies and professional associations; the present writer has been privileged to attend several of them, and the outstanding feature has been the remarkable difference in local circumstances. The area to be dealt with may be purely agricultural land worth £50 or less per acre, or it may be ripe for building purposes and worth £500 per acre before the roads are made, and from £800 to £1,250 per acre afterwards, or at any intervening price. The area may be one where the roads are already arranged or even partly constructed, the scheme being required to preserve the amenities of the district and prevent the erection of factories alongside already occupied villas; or it may be one where the roads are not constructed nor even set out, and the landowner unable to deal with the financial part of the work without outside assistance. The area may be one where the landowner is willing to have the number of houses limited to eight, ten, or twelve per acre; or it may be one where the lower working-class is to be housed at a rental of 4s. or 5s. per week, and the number of houses per acre has to be thirty or forty to recoup the builder for his outlay and leave the margin required by the landlord to cover ground-rent and road-making. (It is certain that small houses must be allowed, otherwise two or three families will inevitably arrange to occupy one house, and the interior of the house will be a slum, whilst the exterior is everything that could be desired in a garden city).

From the point of view of a local authority, town planning is in theory the only thing. But if, after laying down a scheme, the land is not taken by builders and covered with model houses, the landowner is injured and houses are erected on other estates with less salubrious surroundings, all the labour expended in preparing the scheme being thrown away. From the point of view of the builder, the investor, and the landowner, the whole question is one of finance, and for any great progress to be made, the question of finance must be carefully considered.

Where land is worth £50 per acre, a ground rent of less than one penny per yard per annum will cover both the value of the land and the cost of street-making; and at this there is no difficulty either in keeping the number of houses per acre down to ten or twelve, or in providing a decent sized piece of land even for the smallest type of house. Where land is worth more than £500 or more per acre, the ground rent will need to exceed twopence per yard per annum to cover both the value of the land and the cost of street-making on model by-law lines. Therefore, to bring the estate within reach of the working man, either a larger number of houses per acre must be allowed, or there must be some relaxation of the model by-laws as to streets and buildings, a power which is specially

provided by section 55 in conjunction with the fourth schedule of the Act. At a price between £50 and £500 per acre, the problem varies in ratio to the price *plus* the cost of street-making. It is for local authorities, when preparing town planning schemes, to consider what relaxations they can consent to in return for healthier surroundings and amenities.

First, then, with regard to streets. The model by-laws generally prescribe that a street shall be 33 ft., 36 ft., 40 ft., or even 50 ft. in width under certain conditions, that the streets shall be properly sewered, made, kerbed, channelled, and flagged; the cost of which works out at from £2 to £3 per foot run according to width and nature of materials. It was suggested at the Town Planning Conference, held in London on April 24th last, to divide the streets into two classes, according to traffic: (*a*) to construct main roads from 70 to 100 feet in width, arranged and constructed to take all the traffic ever likely to come over them; and (*b*) to arrange the secondary roads so as to discourage or prohibit through traffic, to be only available for access to houses, and to be accordingly very much narrower, less substantial in construction, and possibly not provided with either kerbs or channels, the footpaths being provided with only one row of flags instead of being flagged the whole of their width.

Secondly, with regard to buildings. The model by-laws with regard to buildings are not very onerous, except with regard to brickwork; and this is not felt so much in London as it is in the northern and midland counties, where bricks are so much better in quality than in the metropolis. The carrying of party walls through the roof is quite unnecessary for two-storeyed houses; a 9-in. wall might be allowed 30 ft. or 32 ft. high instead of only 25 ft.; the 18-in. open channel between the slopstone pipe and the gulley might be dispensed with; but with the exception of these there is not much to complain of, and it is difficult to see what relaxations can be allowed in the model code. It is certain that the erection of small houses as detached or semi-detached villas adds to the cost in many ways: there is an extra gable wall, with its foundations and slating; an extra footpath alongside the gable; an extra length of front and back and party fence, and other items.

It may be pointed out that if there are no relaxations of by-laws, and if landowners will agree to lay out their estates on town planning lines, there will be no need to lay the scheme before the Local Government Board, and much time and office work will be saved.

Finally, it must be remembered that the dreams of the idealist must be transmuted into something practical before they can serve as a basis for town planning and the laying out of garden cities.

MR. F. W. SPURR (York) said in York the method of private street construction consisted in laying the footways with 3-in. Yorkshire flags, 12×8-in. kerb, paved channels 14 in. wide, whilst the carriageway was constructed of either 9-in. stone pitching or 6-in. concrete, finished with 3-in. tar macadam the full width between channels. By adopting the following method of construction a saving of about 30 per cent. could be made, and the Corporation agreed to the amended method of construction, provided the width of the street was not less than 42 ft., and the distance between the houses themselves 62 ft.:—Footways constructed of tar paving composed of limestone chippings in place of 3-in. Yorkshire flags; 10×3-in. kerb in place of 12×8-in.; channels 8-in. wide in place of 14-in.

With regard to the carriageways in residential streets, he did not advocate any alteration in the form of construction beyond reducing their width to about 16 ft., the remaining width being grassed and planted.

He did not think much could be done to economise cottage construction. There could be no doubt that to build at the least possible cost cottages must be erected in blocks of not less than six. Some saving could be effected where by-laws provided for carrying the party walls through the roof, a precaution which he thought unnecessary, and something might also be saved by an alteration in the thickness of walls for two-storey cottages as suggested.

MR. E. R. MATTHEWS (Bridlington) said local circumstances varied so considerably that a town planning scheme for one town would be very little guide for preparing a scheme for another town. The cost of road making should be reduced, and in all subsidiary roads in a residential area the width of the road should be 30 ft. instead of 40 ft. as usually required by the by-laws. He would divide this up as follows:—the roadway to be 16 ft. in width, 3-ft. grass strips to be laid each side of this road and trees planted, and 4-ft. footpaths constructed on the inside of the grass strips. He would make all roads in a residential area of tar macadam; and even in the subsidiary roads he would put in a good foundation and construct the road in a substantial manner, so that it would be able to carry occasional heavy loads that pass over the roads, even in wet weather when the road was more likely to be affected. He did not see why two families occupying the same house should not keep the house in as healthy and clean a condition as one family could. The Local Government Board had recently recommended the Doncaster Corporation to divide their houses into two tenements, thus enabling the people who could only pay three shillings per week rent to find a place of abode.

MR. R. W. CASS (Farnham) said it was not necessary that every cottage should face upon a street; and was it not necessary to try to reduce the length rather than the width of streets? This might reduce the cost of streetage. Generally, too, he thought that kerbs were much more heavy than need be.

York Fifty Years Hence, by TEMPEST ANDERSON, D.Sc.

FEW towns present such an instructive history of Town Planning as York.

There was certainly an earlier settlement before the times of the Romans, and this is supported by the name Eburacum, which contains the syllables Yorac, the same as Ure, the old name of the river on which the city is situated, and which is still applied to its higher reaches. The very situation of York was determined by the ridges of glacial drift which here cross the valley from Tadcaster to Stamford Bridge. Primeval man in all countries has sufficient intelligence to choose the driest path along the top of the ridges, and the primitive track was followed by the Roman road, of which traces are preserved in the name of Street Houses, where parts of it still remain open as a bridle-path through the fields, though superseded for carriage traffic by the modern road, which follows a less direct line. Such diversions, when the land is uninclosed, are very common, and are often determined by such trivial causes as the old road falling out of repair or being blocked by encroachments. Nearer York I have seen a well-preserved piece of the road crossing Queen Street outside the walls, and it continued straight down Toft Green to a ford at the Guildhall, and so up Common Hall Lane to the main gate of the Roman city. Roman piles are preserved at the Guildhall, which were taken out of the bed of the river at this ford, and the foundations of the gateway exist in the cellars of the insurance office in St. Helen's Square. I could give similar details of several other primeval and Roman roads, but this must suffice for our present purpose.

The Roman castrum, or camp, was evidently most carefully planned. It was rectangular in form, and parts of the foundations of its walls can still be traced from the south-west gate above mentioned in St. Helen's Square* to the Multangular Tower in the Museum Gardens, which was the west corner of the Roman city. From this corner it can be traced to Bootham Bar, the north-west gate, from which led the main road to the north, and much of it is concealed under the present mediæval wall behind the Deanery gardens to the north-east gate in Mr. Gray's stable yard, the road from which led to Derventio (Malton) and the Cawthorne Camps.

Passing Monk Bar, it still followed the line of the mediæval wall till it turned to the south-west across a street which still bears the Saxon name

* St. Helen was mother of the Roman Emperor Constantine, who died in York.

Aldwark (old fortifications) to the south-east gate in King's Square, whence led the road along the ridge to Stamford Bridge, and thence to Bridlington. I have seen Roman piles where this road crossed the foss in Walmgate.

The main street (Via Principalis) still exists as Petergate from King's Square to Bootham Bar, and when the main drainage was being put down in my boyhood, I remember seeing a piece of Roman drain exposed at the end of Grape Lane. It was about a foot deeper than the new brick drain, and far more solidly built of carefully hewn stone.

The main cross street started from St. Helen's Square, and parts of it still exist as Stonegate and Chapter House Street. The line of it passes through the choir of the Minster, which is the most recent part of that edifice, and the street was doubtless diverted at the time of its building.

There can thus be no doubt that the Roman city was built on a carefully-thought-out plan, and formed part of an organized system of roads and works constructed to suit the natural configuration of the country. A modern royal engineer could not have planned them better.

During the centuries which followed the Roman evacuation of Britain, the city was devastated by incursions of northmen, many of them Goths, who in the first instances were barbarians but later on became civilised at and after the Norman Conquest, chiefly under French influence, and produced the glorious Gothic architecture of which the Minster is such a fine example.

As the city grew and extended to the west and south-west, other portions were included in the mediæval walls, which date for the most part from post-conquest times, and were last put in repair at the time of the Civil Wars in Stuart times.

During these wars the country round York suffered much, and a great part remained uninclosed, or as half-year land, till towards the close of the eighteenth century. My grandfather remembered when every winter the fences were taken down, and no obstacle existed to any one walking anywhere over the site of the present station as far as Acomb, and even I have heard old people talk of the part beyond Holgate as "the broad common."

At the enclosure, about 1780–90, York's great opportunity was lost. It would have been quite easy to have retained a "town belt" round the walls, as has been done in most towns in New Zealand. It was even actually proposed to keep a broad road outside the walls over the site of the present station from outside Micklegate Bar to Marygate, where a

bridge was to have been built. This would have allowed the stage coaches from London to the north to have gained the north road in Bootham without entering the city, and would have obviated the necessity of pulling down the beautiful old Ouse Bridge. The proposal never had a fair chance, but was defeated by the opposition of the innkeepers inside the town.

About the beginning of the last century the necessity of providing for the through traffic from north to south through the city began to be apparent, and after prolonged wrangling, an Act of Parliament was obtained for a broad street, extending from Fishergate on the south, through the centre of the city to Bootham Bar on the north road. Parts of this were actually made, viz., Parliament Street and St. Leonard's Place, but before the rest of the street was made, the party representing Coney Street interests got into power, and all the works were stopped. Parliament Street became merely a market place, and St. Leonard's Place an ordinary street, so that all the money was wasted, and no through street obtained.

An attempt was made a few years ago to complete part of the scheme south of Parliament Street, though not on the original scale, and the most expensive part of the work, a bridge over the foss, has been executed, but the connecting link to Fishergate yet hangs fire and will be very expensive, though in the first instance it could have been comparatively cheaply done when the land was worthless swamp. Even when this is completed the link from Parliament Street to St. Leonard's is still wanting, while more money has been spent uselessly in widening Davygate piecemeal than would have made the straight street originally, while untold sums have been spent in widening corners in Coney Street, Nessgate and making Clifford Street, all of which might have been saved if the original Parliament Street scheme had been carried through.

This policy of piecemeal widening has been going on all my life. Whenever I have asked any member of the corporation, "When are you going to take the suburbs in hand?" the answer has always been, "We have to spend more than we can afford to improve the old city. The suburbs must be left to private enterprise." The result has been that all the suburbs have grown up as slums without any plan, only short streets of the narrowest width allowed by the by-laws have been built, and houses with every dimension the smallest allowed have been run up. A few years ago new by-laws were obtained, which were, I believe, on the Board of Trade models. I do not believe they even stipulate for any minimum cubic space in the rooms of houses, but they prescribe a minimum width

for streets, and that for proposed long streets is greater than that for short. The result has been what might have been expected: no long streets have been built, but only a network of short ones. The new suburbs of Leeman Road and South Bank are in many respects worse than the older ones, such as the Groves.

And now as to the more immediate present and future.

York has from time immemorial possessed several large strays, of which the most important are Micklegate Stray, better known as Knavesmire or the Racecourse, Bootham Stray, Monk Stray, and Low Moor, besides some smaller ones. These are remnants of the old common lands which have escaped enclosure. The freehold is vested in the Corporation, while the eatage of the grass has always been the privilege of the freemen residing in the ward to which the stray belongs. Before the passing of the Reform Act in 1831, no one but freemen were allowed to practise almost any trade or calling in the city, so that the right of pasturage was enjoyed by practically all citizens. That Act, while conferring other civil rights on others, retained the right of pasturage to the freemen, who are a decreasing body; and there was a danger that as the number further decreased the strays might pass into private hands. A few years ago a number of citizens, of whom I was one, urged on the Corporation that they should take steps to extinguish these rights, so as to prevent the lands, which have the making of magnificent parks, from being further alienated. And we suggested that the Corporation should obtain an Act of Parliament limiting the right of pasturage to existing freemen and their widows, and to the sons of existing freemen, so that by the lapse of a generation the lands should revert to the Corporation for the use of the citizens.

Unfortunately this was too simple and inexpensive a process to suit all parties. The opposition of the whole body of freemen was considered too serious to be faced, and instead of some scheme for the equitable compensation of existing holders and the gradual extinction of the rights, one stray was selected to be taken first, and a most expensive bargain was made, into which it is too long to enter here, by which a large money payment was secured to the freemen of that ward in perpetuity, leaving the other strays to be dealt with later. This process will have to be faced before the other strays can be dealt with as parks for the public benefit.

I have given much thought to the best plan for the development of the York suburbs. During my student's life in London, I became familiar with the Bloomsbury Squares, which are built on the rectangular

plan; and on my first tour abroad in 1869, I was much struck with the construction of Carlsruhe, which is built with streets radiating like the spokes of a wheel, with others connecting them in a circular direction. Both areas had evidently been built brand new on a predetermined plan, but either plan in its entirety was obviously impracticable to be applied to an old straggling city like York.

At present there are a great number of roads radiating from York, some of which no doubt require improving or even supplementing, but the great necessity is for improved communications in a circular direction. A vehicle at Acomb, for instance, requiring to go to Dringhouses must come round by York, a distance of two or three miles, though less than half a mile of new road would enable a direct course to be taken at a considerable saving of distance, and almost the same applies to the want of a new road from Heworth, and the Malton Road say near Elmfield to the North Road at Clifton, connecting with the roads to Huntington, Haxby, Wigginton and Rawclift on the way.

Any new scheme of town planning for York must therefore include, at any rate, one circular road at the outskirts of the area at present built upon, and keep in view the probabilities of another, further out, in view of further developments.

A plan was shewn with one such complete ring, and a large part of another on the western side, where the city is extending most rapidly. I am not a professional land surveyor, and am very sensible that it is only a general idea, and that all the details require working in by a master-hand, someone who has had large experience of similar work elsewhere.

The inner ring might start from Clifton Scope, where a bridge would require to be built, and traverse the vacant land between the Leeman Road houses and the river, to near the waterworks, where it would cross the railway by the existing bridge. The lane from the bridge to the Poppleton Road would require widening and grading. Crossing the Poppleton Road it would go almost due south to the Acomb Road, which it would cross near the present tramway terminus, thereby developing the rising ground west of the waterworks reservoir and the existing road into first-rate villa sites. After crossing the Acomb Road it would follow the line already approved by the Corporation through the Holgate Gardens estate and some fields to Hob Moor which it would cross to the Dringhouses Road before coming to Mount Villas. The exact point of crossing the railway, and whether over or under, would require consideration. It would then cross Knavesmire, keeping to the north or city side of the round race-course, till it joined the existing avenue, which it would follow to

just beyond the grand stand. From this point there is a line clear of all buildings beyond the South Bank estate to the river and across it to the Fulford Road, near the north end of St. Oswald's Terrace. This part of the road should be secured, even if the building of the bridge had to wait some years. Crossing Fulford Road, it would cross fields and Lowmoor nearly to Heslington, developing the tract of land between it and the existing lane, with which it runs parallel. Before quite reaching Heslington it would turn through fields and possibly part of Lowmoor to the ridge beyond Garrow Hill, and join the Hull Road before coming to the Bees Wing Inn. It would cross this road and go right across the low land to the middle of East Parade, Heworth, following almost the line of Bull Lane for the latter portion of the way. This portion would develop some of the best building sites still remaining about York. The low land by the beck should be acquired for a recreation ground, as it is too low to be built on. Some expense would here be incurred in a bridge over the railway, which might have been obviated if the plan had been in existence a few years ago.

Crossing from East Parade at the end of Bull Lane to Heworth Moor along the existing lane would require the purchase of some cottages and a house. After crossing Heworth Moor the road would continue straight across the plateau nearly to the foss, near Yearsley Bridge, where it would join a straight road from the corner of the Malton Road, near Elmfield College, across the foss, in front of Rowntree's new dining hall, to the Wigginton Road at the railway bridge over the Foss Islands Branch. It would cross the Scarborough line by a new bridge north of the existing Burton Lane Crossing, which would be diverted to the new road. The road would then continue straight to the North Road, near Clifton Asylum. After it passed the corner of the existing Burton Lane cottages, the ring would leave the above straight road and a short piece would bring it into Water Lane, and so on to Clifton Green and Clifton Scope, thus completing the circle. The portion of this road beyond Clifton and Burton Lane ought to open out the district around Bootham Stray, which if properly planned round the stray as a park, ought to make a most attractive residential suburb. Should the Corporation decide to invite competition for plans, and raise a fund for prizes, I am quite ready to subscribe one hundred pounds to give it a start.

I can only hope that this may lead to the fulfilment of the prophecy by some old Yorkshire witch whose name I forget (perhaps Mother Shipton): "Lincoln was, London is, and York shall be: the finest city of the three."

Sewage Disposal in Rural Districts, by ASCOUGH RODWELL, Engineer and Surveyor, Skipton Rural District Council (ASSOCIATE).

THIS subject covers a field too wide for thorough investigation in this paper; so, to facilitate matters, the author refers to a rural district (as a typical one) with which he has had some acquaintance. It has in parts a scattered population, whilst in others the contributory places consist of mills and streets, making them really urban in character.

In these latter cases proper sewerage schemes are inevitable. The closets are principally on the water carriage system, and the sewage containing comparatively little trade effluent is easily dealt with by settling tanks, the effluent being treated on land (if suitable land is available) by some type of percolating filter, or by contact beds.

For villages, the disposal works should be as simple as possible, as in very few instances only can a man be fully employed in looking after the works. In every case the sewage should pass through some form of settling tank to intercept the solids; and preferably with the tank in two sections, so that the sewage can be turned into one section while the other is being cleansed. The liquid may then be turned on to the land, or dealt with by percolating filters or contact beds.

For small village installations the author has used the ordinary rectangular trough distributor, having a central self-acting tipper, with double compartments, so that when one becomes full, and the contents are tipped over into the distributing shoots, the other compartment is in proper position for being filled in its turn. This apparatus is very simple, and only needs attention and oiling about once a week.

For larger villages the "Ideal" distributor (Tuke and Bell's) has been used. This is an open trough revolving distributor, the rotating motion being given by two pawls, working on a toothed base-wheel, and actuated by a central tipper bucket. Each time this tipper becomes full, its consequent tilting action brings one of the pawls into contact with the toothed wheel, causing the distributor to swing round: at the same time the liquid flows into the revolving troughs. One edge of the trough arm being serrated, the liquid is divided and spread in fine streams over the surface of the filter.

For beds of over 15 feet diameter the author has fixed perforated pipe arm distributors of the following types: "Adam's," "Candy Whitaker's," "Farrer's" and "Ham Baker's," also "Mather and Platt's" open trough, all doing good work.

For filtering media, broken bricks, broken stone, river gravel, clinker, and honeycombed slag have been principally used, and the depth of the filter varied from 4½ to 6 ft. according to the fall available to the outfall.

For isolated houses, the methods of dealing with the sewage are many. Some of the mansions have up-to-date sedimentation tanks, slate beds with automatic dosing valves, and everything of the latest type, whilst others (especially farm houses) simply drain on to the nearest available land and distribute the sewage over the surface by open channels cut in the turf, the course of the channels being diverted on to new ground as circumstances require. Some farm-houses are provided with bath, water closet, etc., and frequently the sewage is discharged into the ordinary manure tank, which also takes the drainage from the farm buildings, the contents of the tank being pumped out into barrel carts and distributed over the meadow land in the usual way. The author does not advocate this method, as the tanks are usually not cleaned out often enough, and consequently the odour of the contents becomes very offensive, and is still more pronounced during the emptying of the tank.

A small concrete sedimentation tank having a capacity of about a twenty-four hours flow with submerged inlet and outlet pipes and a filter of sand, fine gravel, or engine ashes will give excellent results, and, if attended to regularly, is a far more preferable method of dealing with the sewage of isolated houses. Also the self-contained tank and filter arrangements now made by two or three firms for the purification of sewage from country houses and isolated buildings are compact and effective: and only in very exceptional circumstances, where the contents can be regularly and frequently taken away, should the old type of cesspool be permitted. Of course many houses have the ordinary block privy, they have no bath, so the only sewage is from the kitchen slop-stone, and the liquid from here is very frequently discharged into the nearest stone drain or brook. This may be termed the easiest way of disposing of the sewage, and certainly the old saying "out of sight, out of mind" is very applicable. The author has known a village of ninety or one hundred houses dealt with in this way, until the river authority came along and insisted upon a proper scheme of sewering; the people were quite content; they enjoyed good health, and, notwithstanding the fact that the stone drains all emptied into the stream which ran through the village, the stream was simply alive with trout, and the fishing of the river just below was regarded as one of the best lengths in Yorkshire; the chances of one's election as a member of the local fishing club being very remote.

At one village of about 200 inhabitants where sewage works have been established, the treatment is by simple tanks, the effluent being turned into open channels on to the land. One day the author received a complaint from the river authority that it appeared from a report by the inspector the effluent from certain works discharged into the river was not satisfactory,

aud would he be good enough to see the matter was attended to at once, etc. He immediately visited the works, and certainly the effluent where it joined the river was a trifle cloudy, but about a yard away from the effluent pipe was a group of some of the finest trout he has ever seen (most of them, he estimated, would turn the scale approaching one pound each), all their noses were pointing in one direction, waiting for some tasty morsel coming down the pipe.

In another case, where the drainage of a village of about twenty houses simply consisted of stone drains discharging at different points into the river, the council had their attention called to the "serious pollution," etc. It was plain to see where the various drains terminated at the river, but the water in the river was beautifully clear, and, out of mere curiosity, the author had a sample of water taken below the village (this was after the river had received all the so-called pollution) and sent for analysis. The following is the footnote on the report:—

> "This is a very soft water of moderate organic purity, suitable for both drinking and domestic purposes."

These two instances are mentioned simply in support of the contention "that there ought not to be the same rigid requirements as to the standard of purity of the effluent from small rural villages (where the quantity of sewage effluent is, comparatively speaking, a mere drop in the bucket") as for towns where the quantity discharged into the stream is much greater.

When, however, the effluent has to be discharged into a small stream (which in summer time is probably dried up), the standard of purity should, of course, be higher. The author has in his mind an instance of this kind, where the effluent was discharged into a stream below a weir belonging to a corn mill: when the mill was working, all the water flowed along the mill race to the mill. Thus there was no water in the stream itself, except the effluent from the sewage works, and this being the only water supply for the cattle pasturing in the land alongside the stream below the works, it was absolutely necessary that the effluent should be as pure as possible.

The modern methods of dealing with sewage by tanks, bacteria beds, etc., has enabled disposal works to be placed much nearer the houses than was permissible when the method of treatment was by broad irrigation, or even intermittent filtration over land. Also the area of the land required for the works is much smaller. The council have just recently completed disposal works for two villages, the combined population being over 600. The works consist of sedimentation tanks, percolating filters, storm-water tanks and filters, sludge beds, humus tank, and tool house, and the whole area, including fence walls, measures less than half an acre.

Sewage Treatment.—Advantages of Land over Artificial Schemes, by JOHN MANLEY, C.E. (MEMBER).

THE cry, "Back to the Land," is not inapplicable to the subject before us. It is satisfactory to note, and the author claims this to be one of the advantages of land, it is *always* ready to receive and able to deal with whatever humanity offers. It is further claimed that land is permanent, and as a medium for the purification of foul matter has held its own through all time. On the other hand, much advertised artificial schemes of fifteen to twenty years ago have sunk into oblivion. Although such schemes, constructed at very great expense to the authorities concerned, may be working with more or less satisfaction to those authorities, yet they have not been generally adopted or copied by engineers acquainted with them.

From the Public Health Act of 1875 passing into law to a very recent date, it was the invariable practice of the Local Government Board to refuse sanction to any loan for sewering or sewage disposal works, where there was no provision of a suitable area of land for sewage outfall works (usually called a sewage farm); a very wise precaution, because such land not only provided a site for whatever works might be adopted, but also for the deposit of house refuse where it could be properly dealt with, and if properly laid out would deal with the sewage in all exigencies, accidents and instances where artificial schemes failed. But recently the Local Government Board, with its present president, has not strictly adhered to this rigid stipulation. The agitation against it was very strong for many years, and led to the appointment of a Royal Commission on 7th May, 1898, with Lord Iddesleigh, C.B., as president, to inquire and report:

I. (1)—"What method or methods of treating and disposing of sewage," etc., "may properly be adopted," etc. (2)—"If more than one method may be so adopted, by what rules, in relation to the nature or volume of sewage, or the population to be served, or other varying circircumstances or requirements, should the particular method of treatment and disposal to be adopted be determined"; and

II. "To make any recommendations which may be deemed desirable with reference to the treatment and disposal of sewage."

The first result was the issue of a short interim report in 1901, which expressed the opinion that downward filtration and broad irrigation were the best means to adopt; the Local Government Board's rule for insisting

on land was a good one; stiff clay land was unsuitable, but no land was useless, much depends on the depth of top soil, but a larger area helps.

The report then dealt with artificial processes then in use, viz., closed and open septic tanks, chemical treatment, subsidence tanks, contact beds and continuous filtration, in various combinations; arriving at the conclusion that it is possible to do with artificial schemes in some cases (Leeds and Manchester), but no general rule was possible for dispensing with land.

At the health congress at Exeter, August 1902, Lord Iddesleigh is reported to have said: "They (the Commission) would soon, he hoped, be able to publish the results of a prolonged investigation into the treatment of sewage on land; their experts were now making elaborate parallel examinations of some of the processes of filtration by artificial means.... The subject was inexhaustible." The position seems to be much the same to-day. The Commission is still investigating, but has issued seven reports, of which the fifth is interesting for the purpose of this paper. It refers to 144 meetings and the examination of 204 witnesses.

On page 18 of this report we read: "It is true that at (several towns are named), and elsewhere, crude sewage has been satisfactorily purified in filters with almost complete absence of nuisance, but at most of those places this plan has been abandoned, because of the rapid choking of the filters." On page 22: "As regards the second claim, we find as a result of a very large number of observations, that the sewage issuing from septic tanks is bacteriologically almost as impure as the sewage entering the tanks." On page 44: "In the majority of cases we think it would be better to adopt chemical precipitation, rather than septic tanks as the preliminary process for very strong water-closet domestic sewages."

Contact beds and percolating filters, with sprinklers or other distributors, are more favourably spoken of, the latter being the more efficient. After very exhaustive details relating to automatic gear, loss of capacity, construction, dimensions, size and grading of filtering material, cost, etc., and a general summary, favourable to percolating filters except that they are more liable than contact beds to nuisance from smell and flies, we find these general conclusions, viz.:

"We are satisfied that it is practicable to purify the sewage of towns to any degree required, either by land treatment or by artificial filters, and that there is no essential difference between the two processes, for in each case the purification, so far as it is not mechanical, is chiefly effected by means of micro-organisms."

"The selection of a method of sewage disposal should depend primarily on local conditions."

"If a sufficient quantity of good land, to which sewage can gravitate, can be purchased for about £100 an acre, land treatment would usually be the cheapest method to adopt."

"In cases where only clay land is available, it would generally be cheaper and more satisfactory to provide artificial filters."

In comparison of effluents "judged by chemical analysis," the Report says, "both classes of effluent possess similar qualities."

As regards eight farms not eliminating suspended solids, the average purification was about 98 per cent.; as regards seven contact bed plants, but eliminating suspended solids, 93·4 per cent.; as regards six installations of percolating filters, after eliminating suspended solids, 99·4 per cent.

There is one other great disadvantage in contact-beds and percolating filters, which applies to a great number of cases, *i.e.*, where a low-lying district, or area, gives a low gradient to the stream which has to receive the effluent, making it quite impossible to construct beds of sufficient depth. Land treatment presents no such difficulty. Screening and detritus chambers can be made shallow, and the carriers follow the contour lines, but the depth of each contact bed or percolating filter, where adopted, must be deducted from the available fall, often necessitating raising the sewage.

Attention is now invited to successful instances of land treatment. First, small towns:

1st, Redruth (Cornwall). Designed by the late Silvanus W. Jenkin, M.I.C.E., and carried out in 1889–90. Population about 10,000. Twenty acres of land, let at a small rental to farmers, who took all responsibility. The effluent discharging into a small stream by the side of a main road, the stream finding its way to Portreath, a small harbour three and a-half miles distant. The writer inspected and reported on it in 1892 and 1895.

2nd, Wokingham (Berks). Three small sewage farms, an aggregate area of 13 acres; population 5,000. The writer took charge of them in 1897 as borough surveyor. The Thames Conservancy take samples of the effluent periodically, and exact a high standard. The soil being stiff clay made the working difficult, and chemical precipitation had been introduced; but by cultivation of the land, collecting and burning house refuse, then putting the ashes on the land, its quality was soon improved, and it was found possible to do without precipitation. Contact beds have, however, since been constructed for a portion of the sewage only. Last year the Corporation purchased over twenty acres of adjacent land; but there is no immediate intention to use it for sewage disposal purposes.

As examples of greater magnitude, reference may be made to the

Berlin sewage farms, 43,009 acres.* Here we are told of the successful disposal of sewage from a population of 2,137,034 by land treatment, with a profit of 11·1 shillings per million gallons on the working expenses.

A better example, or rather one more likely to be followed, is the Aldershot Camp Farm. This has been managed by Lieut.-Colonel A. S. Jones, V.C., for seventeen years, of whom Mr. Roechling says in a book published ten years ago: "Colonel Jones has done more than anyone else living to establish correct views on sewage farming." This farm consists of 131 acres, but allowing for roads, buildings, etc., 120 acres are under cultivation. It dates from the return of the troops from the Crimea in 1856. When Colonel Jones took it in hand in May, 1895, the farm was in bad repute and in bad condition, having been for fourteen years leased by the War Office to a tenant who paid rent, but failed to satisfy the Thames Conservancy. These conditions were soon altered, and for fifteen years the farm has been ideal. The subsoil is sand and gravel, the surface nearly flat, all underdrained by 3-in. pipes 12 yards apart, the main drains 6-in., 9-in. and 12-in., the effluent gathered to one point, whence it flows in an open dyke about 250 yards to the River Blackwater, which also receives the effluent from Aldershot Town a mile or so above. The carriers (nearly all land furrows) follow the contour of the land, having been carefully levelled, are about 20 yards apart, and are re-formed every two years. The population is usually 30,000, the estimated daily flow 1,000,000 gallons. The Connaught Hospital, with medical officers' and nurses' quarters, quite new buildings, are within 200 yards of the farm boundary, and are supplied with milk from the farm, which also supplies other hospitals.

The sewage is received at four points known as, Wellington lines (15″), Stanhope lines (15″), Marlborough high-level (12″), Marlborough low-level (12″), each of which has catch pits (or detritus chambers), screens, and subsidence tanks, from which the sewage passes on to the land; the deposits are mixed with manure from cows and sold or used on War Department land at the Royal Military College and Remount Depot. Rye grass is sold and delivered at 30s. per ton if within two miles, beyond two £2 per ton, if fetched at 20s. per ton.

The buildings consist of a good house for farm bailiff, six good cottages, offices for manager and bailiff, a well-designed and appointed dairy, two stables of six stalls in each (one being for large cart-horses, the other for cobs), two houses of superior design, each for twenty-four dairy cows, with 1,000 cubic feet per cow, a yard and shed for bullocks, and an engine-

* H. A. Roechling, *Journ. R. San. I.*, Vol. XXXIII., p. 178.

house which contains a four-horse power engine to work chaff cutter, etc., a vertical boiler which provides steam for boiling and steaming all dairy utensils. Special precautions are taken by boiling all dairy churns and vessels once a week in summer, and once a fortnight in winter, thereby insuring perfect sterilisation. All produce is weighed, and records elaborately kept, each cow (usually forty are kept) is numbered, and its milk weighed separately, morning and evening, the record for 26th June, 1912, averaged 17·18 lbs. in the morning, 15·36 lbs. in the evening, or 3·16 gallons per cow for the day; the cows are usually purchased soon after calving, kept as long as profitable, then sold for feeding. Young bullocks are also bought when a year old, kept a year, then sold at a profit of from £4 to £5. There is also a store sow with its young pigs always kept to consume dairy washings and waste.

Rye grass is the principal product, but root crops are also grown. About thirty hands are employed, and the farms of Sandhurst Royal Military College, Pirbright and Ewshot Barracks (at each of which one man is kept), are administered and worked from the camp farm.

The writer went over it on a fine day, 27th June, and on a wet evening after a heavy rainfall, 2nd July, and found its appearance excellent and the effluent free from smell, colour, or offensive taste.

LT.-COL. ALFRED S. JONES (Finchampstead) said the paper was valuable as expert testimony to the satisfactory state of the disposal of the sewage of 30,000 population on 130 acres of land for the last seventeen years at the Camp Farm, Aldershot, of which he had charge. For more than forty years the advantages of land over artificial treatment had been proved wherever the management had been good, and he (Col. Jones) was indebted to the exertions of the best of agricultural workers for any success under his management. It had been his desire to "direct the great sources of power in nature to the use and convenience of man," not to force natural agents to work in artificial channels; and, agreeing with all the author had stated in his paper, he was content to retire with good hope that younger men would be equally successful on the same lines.

MR. G. WILLIAM LACEY (Oswestry) said he could agree with the author's first remark that the practical and economical treatment of sewage was an inexhaustible subject, but certainly the paper was not at all exhaustive, and he failed to find any particular advantages of land treatment indicated. He would say that not even the strongest advocate of artificial treatment would contend that this method was superior to land treatment carried on under favourable

conditions. Given suitable and sufficient land, Nature's own method was the best, and this applied not only to sewage disposal, but to other things also. But progressive science had been called on to assist Nature, and if it had not been so civilisation would not have reached the standard it had. He did not like the disparaging references to the earlier artificial processes, and he suggested that the names he mentioned, and others who were pioneers of bacteriological treatment of sewage, would be more likely to be remembered in the history of sanitary science than to be consigned to oblivion. It was from their efforts that artificial methods had been evolved to the present standard of efficiency. That there was scope and necessity for such a method was amply proved by the appointment and investigations of the Royal Commission on Sewage Disposal, and from the fact that in many places neither suitable nor sufficient land was easy of acquisition.

Councillor A. Upson (Maidenhead) said at Aldershot Nature had provided a vast filter bed, the soil being sand and gravel. The case for Wokingham was given away by the statement in the paper that contact beds had been constructed. Every engineer would be prepared to use land if available, but this was the crux of the whole question: land in quality and quantity was not available near large towns. And, after all, was not the bacteria bed but a condensed form of land treatment. In regard to the work of Col. Jones, every sanitary authority in the country owed a debt of gratitude to him for his persistent warnings concerning patented processes of sewage disposal.

Mr. R. W. Cass (Farnham) said that one system of sludge treatment at Farnham was as follows, and was very economical:—On concrete beds with side channels the straw, paper, and other such matters were built round in thick walls daily. The sludge was pumped into these beds, and the liquor filtered through the refuse walls and flowed back into the tanks. The sludge was covered daily by the town's refuse carted from the dust bins. The beds, thus built up to a height of about seven feet, were then allowed to dry off, and the local farmers bought the product of the sludge and house refuse at 9d. per load, and carted it away from the works. The process was carried on quite near to houses, and no nuisance whatever was created; indeed, the mixture of the sludge and the house refuse created less than did the refuse by itself.

Dr. Gilbert Fowler (Manchester) could not claim to have read every word of the many blue books issued by the Royal Commission, but he had studied the greater proportion with interest and profit, and he felt that the work of the Commission had been of the greatest importance, not least their very careful studies of land treatment. They drew attention to a difficulty in judging of the work of sewage farms, viz., getting a true sample of the

effluent. A portion of land recently ploughed and harrowed would allow the sewage to percolate freely, and for a short time there would be an indifferent effluent. Mr. Clifford, the chemist and manager at the Wolverhampton Sewage Farm, one of the most successful in the country, told him recently that it would be possible at any time for an inspector to take a bad sample by carefully choosing the time and place. That by no means implied that the effluent as a whole was anything but good. At the recent annual meeting of the Sewage Works Managers' Association many of them had an opportunity of seeing the excellent condition of the stream into which the Wolverhampton effluent flowed. It, however, emphasised the need for careful and scientific management; and he would tell the advocates of land treatment this, that the same scientific care had not always been given to the management of sewage farms as to the more modern methods of dealing with sewage.

MR. JOHN MANLEY said it had not been his intention to condemn artificial schemes unnecessarily. He had no object in inducing any engineer to give up a system that was dear to him in favour of land treatment; his desire was to suggest that more attention should be given to the latter in certain cases. The mention of the word "sneer" had rather surprised him. He had certainly not thought of sneering at the Royal Commission, for he himself had derived not a little information from their reports. Mr. Manley added that the Blackwater river, into which the effluent from the Aldershot Camp farms flowed, received sewage from the town of Aldershot. Samples had been taken by the Royal Commission both above and below the point of discharge, as well as by the Thames Conservancy afterwards, and it had been reported that the water below the camp sewage farm was purer than the water above, which contained the discharge from the town sewers.

One Solution of the Sludge Problem, by ARTHUR HINDLE, M.Inst.C.E., and P. HOLT WHITAKER, A.M.Inst.C.E. (Members).

OF the many difficult problems which the sewerage engineer is called upon to solve none gives him more anxiety than the one connected with the satisfactory disposal of sludge.

The authors (in common with other engineers who are called upon to advise local authorities as to their sanitary arrangements) have been faced with this difficulty, and at the sewage disposal works recently carried out for the Penrith Urban District Council under their guidance have installed a system of treating the sludge, which has proved so efficient as to justify them in giving a brief description thereof.

Before explaining the system of sludge treatment it will probably assist in following the description if a brief explanation of the scheme of sewage treatment adopted is first given.

Penrith is a market town in Cumberland and has a population according to the last census of 8,993. There are no works or manufactories beyond two small breweries, so that, with this exception, the sewage is purely domestic.

The original sewage works were carried out in 1850, and comprised a system of main sewers and sewage disposal works on the broad irrigation system on Westmorland Holme, a large area of land near Eamont Bridge, about a mile from the centre of the town.

The new works which are now practically completed, comprise an entirely new system of main and subsidiary sewers throughout the town, an outfall sewer about 2½ miles in length, including crossing of the River Eamont (which was done by means of a gravitating cast-iron pipe carried by a lattice girder bridge of 120 feet span), and sewage disposal works on lands forming part of Whinfell Holme. An area of 25 acres was acquired, but only about 12 have as yet been laid out. The subsoil is eminently suitable for filtration purposes, consisting of a deep bed of gravel, overlaid with about 2 feet of fibrous soil.

The sewage treatment consists of sedimentation in tanks and filtration through land on the intermittent downward principle. There are four circular sedimentation tanks each 40 feet in diameter and an average of 7 feet 6 inches deep, so arranged as to enable them to be worked on the quiescent or continuous flow principle, either separately or in series, as circumstances dictate. Inlet and outlet channels, junction wells and controlling valves are provided.

Before entering the tanks, the sewage passes through screening chambers, which are arranged in duplicate and fitted with Stott's revolving screens. Between the screening chamber and the mixing buildings there is a dividing well whence the storm water flows to specially prepared areas. Three times the dry-weather flow passes to the works for full treatment, and three times passes to the storm-water beds. The buildings comprise mixing-house, small engine-house, with oil-engine and pump, store-room, and office. Up to the present time it has not been found necessary to use any precipitants, but arrangements are made in the mixing-house so that they can be used if required.

After leaving the tanks the effluent passes over aëration weirs, thence into a main carrier, and is subsequently distributed by means of subsidiary carriers over the land filtration areas, which are under-drained with 3-in. agricultural tiles, the number depending upon the nature of the sub-soil in each area, and these in turn are connected to a main effluent drain, which discharges the purified effluent into the Eamont, a well-known fishing river.

The levels of the outfall site were such as did not permit of the sludge being drawn off from the bottom of the tanks so as to gravitate to the sludge drying beds. It was therefore necessary to provide some means of lifting it to the desired level without, if possible, incurring the cost of pumping. This was accomplished by utilising the head of water in the tanks for the purpose of forcing the resultant sludge to the drying beds and to assist in this object an apparatus known as Fidler's Revolving Scraper was placed in each sedimentation tank.

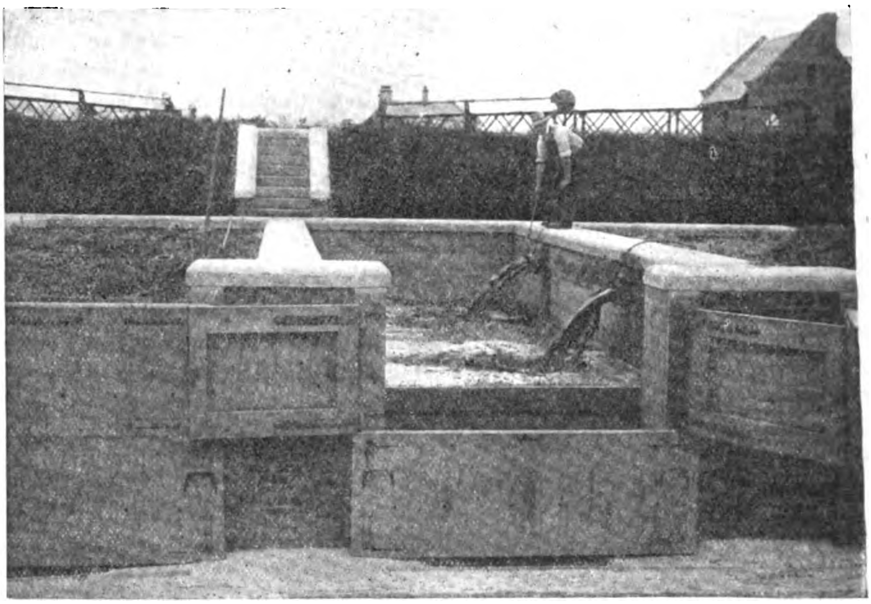
The Fidler Scraper arrangement is intended to facilitate the removal of sludge without interfering with the continuous working of the sedimentation tanks and to deliver the sludge at a level only a few inches below the top water level of the tank. The scraper, by means of which the sludge is directed to a sump in the bottom of the sedimentation tanks, is helical in form; it is attached to and supported from a lattice girder and is rotated by gearing fixed at the side of the tank adjacent to a sludge discharge chamber so as to give opportunity for careful regulation of the discharge. When it is desired to remove the sludge the scraper is revolved and the sludge directed into the central sump from the bottom of which it is forced to the sludge drying beds. Valves are provided on the several pipes to regulate and control the flow.

The sludge drying beds are four in number, each 25 feet long by 10 feet wide by 6 feet deep; they are constructed of brickwork, backed on the outer side with concrete; the floors are made of concrete laid with

proper falls in the direction of the drains. Each bed is provided with doors, constructed in sections, extending the full width of the bed at the lower end, which can be raised or lowered at will as the material in the beds increases or decreases. Cross walls are formed of perforated boards laid in grooves, so as to be easily adjusted.

When the sludge is about to be emptied from the sedimentation tanks, a layer of straw, litter, dried weeds or the like is first laid in each tank or compartment in such a manner that the whole surface of the bed is

PENRITH URBAN DISTRICT COUNCIL SEWAGE DISPOSAL WORKS.



Wet Sludge entering Drying Beds.

covered, the litter is also drawn slightly up the sides of the beds or compartments, as well as round the vertical, perforated pipes or shafts. These perforated, vertical pipes are about 6 inches in diameter, in lengths of about 2 feet, provided with sockets and spigots so that they can be built up in continuous shafts from the floor to the top of the bed as it is being filled. A layer of sludge, to the depth of 4 to 6 inches, is then run on to the litter, which acts as a filter, the litter allowing the liquid to filter through and find its way to the perforated pipes, which in turn are connected to drains laid on the floor of the beds. This operation

of filling the beds alternately with litter and sludge is repeated until the bed or compartment is filled, when operations are transferred to the next bed. The liquor draining from the sludge beds is conveyed to a well, and is then pumped (by the oil engine and pump previously referred to) into the feed channel of the tanks for re-treatment. As the beds are being filled the increasing weight compresses the sludge and litter, thus forming, after proper settlement, a firm bed of manure, which is easily handled and is very portable. A layer of litter is always placed on the top of a layer of sludge to obviate any nuisance from smell which one usually expects to arise from open sludge beds or lagoons.

The illustration (taken from a photograph) gives an idea of the appearance of the beds both during and after the process of filling. The bed on the left is filled, and shows the top layer of straw or litter and the tops of the vertical perforated pipes; the middle bed is partially filled, and shows the wet sludge entering (the man at the disc valve is about to shut off the flow), and also shows the doors and the open channel drain in front. In the background can be seen a portion of the revolving scraper apparatus, the sewage buildings, etc.

The authors were assisted by the surveyor to the Penrith Urban District Council, Mr. J. J. Knewstubb (member), who acted as resident engineer throughout the construction of the sewerage works, and who has supplied, for the purpose of this paper, the following information:—

Population dealt with in the scheme: 8,000.

Daily dry-weather flow per twenty-four hours: 290,000 gallons.

Quantity of wet sludge passed on to the beds per day: 2½ tons, average.

Quantity of dried sludge taken out of the beds per day: 16 cwts, average.

Quantity of dried sludge removed from the beds and sold per annum: About 300 tons, average.

Quantity of litter used in the beds per year: 70 tons.

Length of time occupied in drying the wet sludge: This varies according to the season, but averages about six weeks.

Length of time occupied in filling one bed: About four weeks; varies according to the time of the year, and atmospheric conditions.

Rate of consolidation: Varies according to depth of bed.

Length of time required for the dried sludge to attain its most beneficial condition as manure after removal from the beds: Twelve months.

The sludge is sold by open tender every year, and the average price per cart load realised has been 1s. 9d. per load.

The authors are informed that the sludge removed from the beds after treatment under this system is a most beneficial manure for use on land growing turnips and mangolds, and also gives good results for clover and seed grass at any time and almost under any condition. It has also been found to be an excellent material for ploughing into light land.

No additional expense is placed upon the Council in dealing with the sludge, as the operation of filling the beds is performed by one of the regular men employed on the farm, and occupies but an infinitesimal portion of his time. The emptying of the beds is undertaken by, and at the expense of, the purchaser of the dried sludge, who also provides and brings to the beds part of the litter required; this, of course, being a consideration of the purchase price.

So far as Penrith is concerned the sludge problem has been solved; the authors have, however, up to now hesitated to supply any description of the system as they were desirous it should have a fair and ample trial before doing so.

This description is given purely from an engineer's point of view, apart from that of the chemist. There is, however, the practical side of the question in that the farmers are competitors for the dried material.

The works were completed in the latter part of 1907, were formally opened on the 19th of March, 1908, and have been in continuous operation since.

Note on the extension seawards of the Gynn Outfall Sewer at Blackpool, by JOHN S. BRODIE, M.INST.C.E., Borough Engineer and Surveyor, Blackpool (FELLOW).

THE following note, describing the method of extending seawards a main outfall sewer on the system adopted by the author at Blackpool in 1907, and which has since been adopted at other seaside towns, may be of interest.

The old outfall sewer at Gynn was 1,304 feet in length, and consisted of cast-iron flanged pipes, 3 ft. internal diameter, in 6 ft. lengths, bolted together and supported on timber piles and cradles. This was laid in 1898, at the cost of £6,755, or at the rate of £15 10s. 9d. per linear yard.

The work was carried out by a contractor, and was never completed to its intended length, which was 1,400 feet, on the ground that the difficulties in connection with stormy seas and deepening water were so great that further extension was impracticable.

Since then, sandbanks have formed seaward of the old outlet, and it has been found necessary, in order to prevent the sewage from lodging on the foreshore, to extend the outfall across the recently formed sandbanks into deep water, seaward of the same.

The present extension has been made by means of a continuous steel tube, 3 feet internal diameter of solid welded pipes, in 18 feet lengths, formed of open hearth steel $\frac{11}{16}$ inch thick, rivetted together with cover straps 10 inches wide, $\frac{11}{16}$ inch of thickness, with a double row of $\frac{7}{8}$ inch rivets, spaced 3 inch centre to centre.

The quality of the steel was such that the ultimate tensile breaking stress averaged 26 tons per square inch, with an ultimate elongation of 20 per cent. in 8 inches. The whole of the tube, both inside and outside, was heavily coated with an improved bituminous preservative.

In order that the new tube should fit properly on to the flanged end of the old outfall, 10″ square Karri-wood piles were driven on each side of the trench at intervals of six feet centre to centre and connected by half-timber walings, to which close timbering 3 in. thick was secured, for a distance of 86 feet seaward of the old outlet.

The tube was built up, for a total length of 600 feet, on the foreshore above high-water mark, at a distance of three miles along the coast line from its ultimate destination.

In order that, when laid, the tube should not be subject to a rolling or rocking action on the sea bottom, caused by heavy on-shore gales,

transverse steel bedplates, 9 ft. long by 12 in. wide, and $\frac{1}{16}$ in. thick, turned down at the ends for a length of 12 ins. as shown in figure 1, were rivetted to the tubes at 18 feet centres, except for the 86 feet length referred to above, where the tube rests on steel cradles, bolted to Karri-wood piles.

After being completed, the tube, which is provided with a 24 in. man-hole and cover at each end, and also with blank flanges at the open ends, was filled with water and tested to a pressure of 50 lbs. per square inch, at which pressure it was found to be perfectly tight.

Timber watertight stoppers, easily removable, were then inserted at each end of the tube, close to the manholes above referred to, and caulked up watertight. The blank flanges were then securely fastened to the ends of the tube, and the manhole covers on the two manholes, one at each end, were also secured and made perfectly watertight.

The tube was then launched from above high-water down the fore-shore to such a level between high and low water marks as would enable it to float with a 24-feet spring tide. It was floated into the sea on July 12th, 1912, and towed by means of a steam tug for a distance of three miles, and was adjusted at high water over the trench, by means of guide piles as shown in Figures 3 and 4, where it was ultimately intended to lie. The blank flanges at both ends were then removed, the temporary stoppers maintaining the tube afloat.

On the tide receding, the tube dropped down into its permanent position, the flow of sewage being held up temporarily by the shore penstock valves; the shoreward end flange was then bolted up to the flange of the old cast-iron pipe, by means of 12-1$\frac{1}{8}$ inch steel bolts, and so secured in continuity of the old outfall. The manholes at both ends were then opened, the temporary timber stoppers were removed, and the new outfall was then ready for the passage of the sewage.

The cost of the steel tube, which was constructed under contract by Messrs. Clayton, Son, & Co., of Leeds, was £1,358, and the cost of launching, floating, and laying was £592, a total of £1,950, or at the rate of £9 15s. 0d. per lineal yard.

Figure 1 shows a plan and section of the new outfall tube sewer. Fig. 2 shows the cross section of the sewer as laid on the cradles for a length of 86 feet seaward of the end of the old outlet. Fig. 3 shows the tube afloat, dropping down into its position on the receding tide.

The tube was manufactured and delivered on the foreshore at Black-pool, and the launching, floating, and laying has been carried out departmentally under the author's assistant, Mr. H. Banks, C.E.

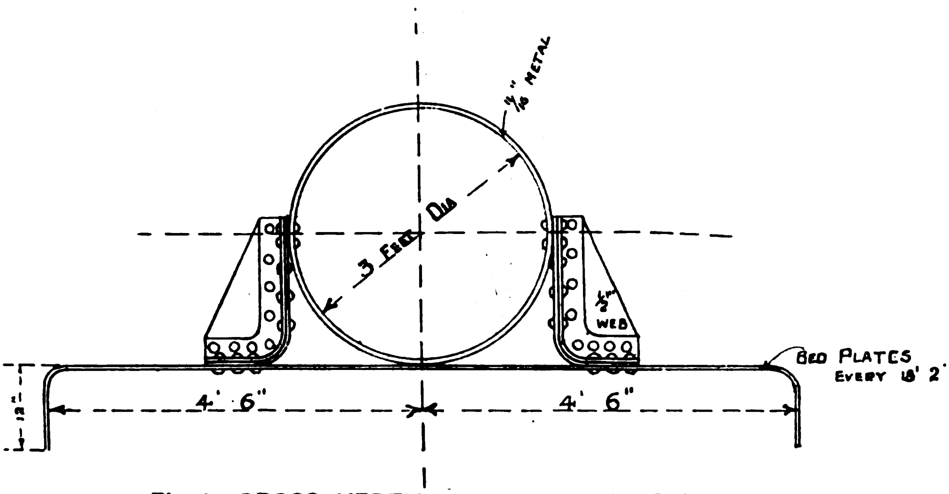


Fig. 1.—CROSS VERTICAL SECTION OF TUBE.

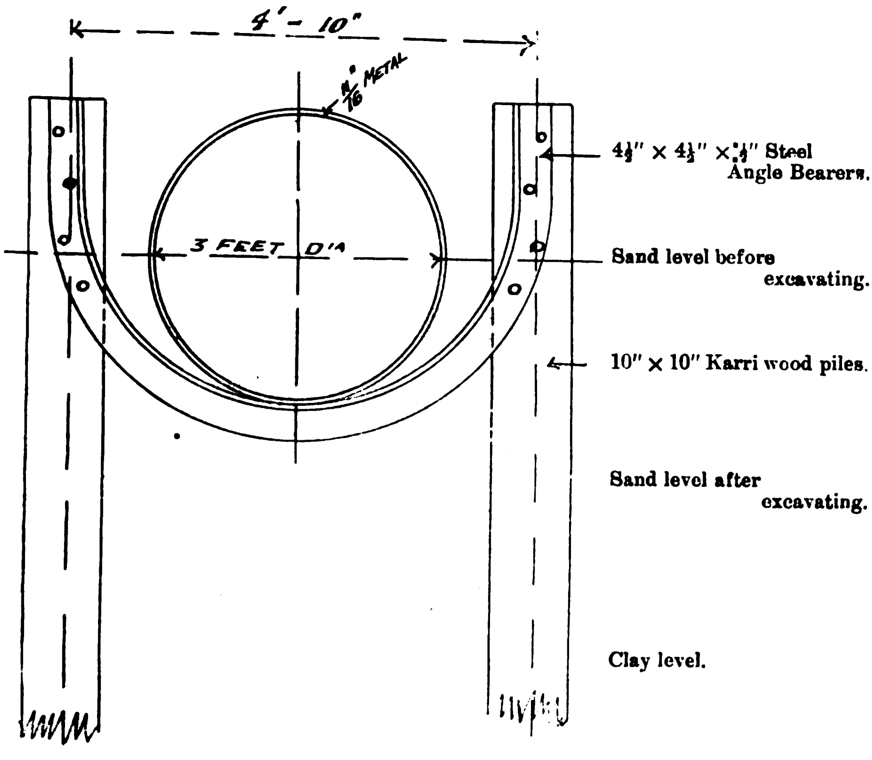


Fig. 2.—CROSS SECTION, showing Piles and Cradling to receive connecting end of Tube.

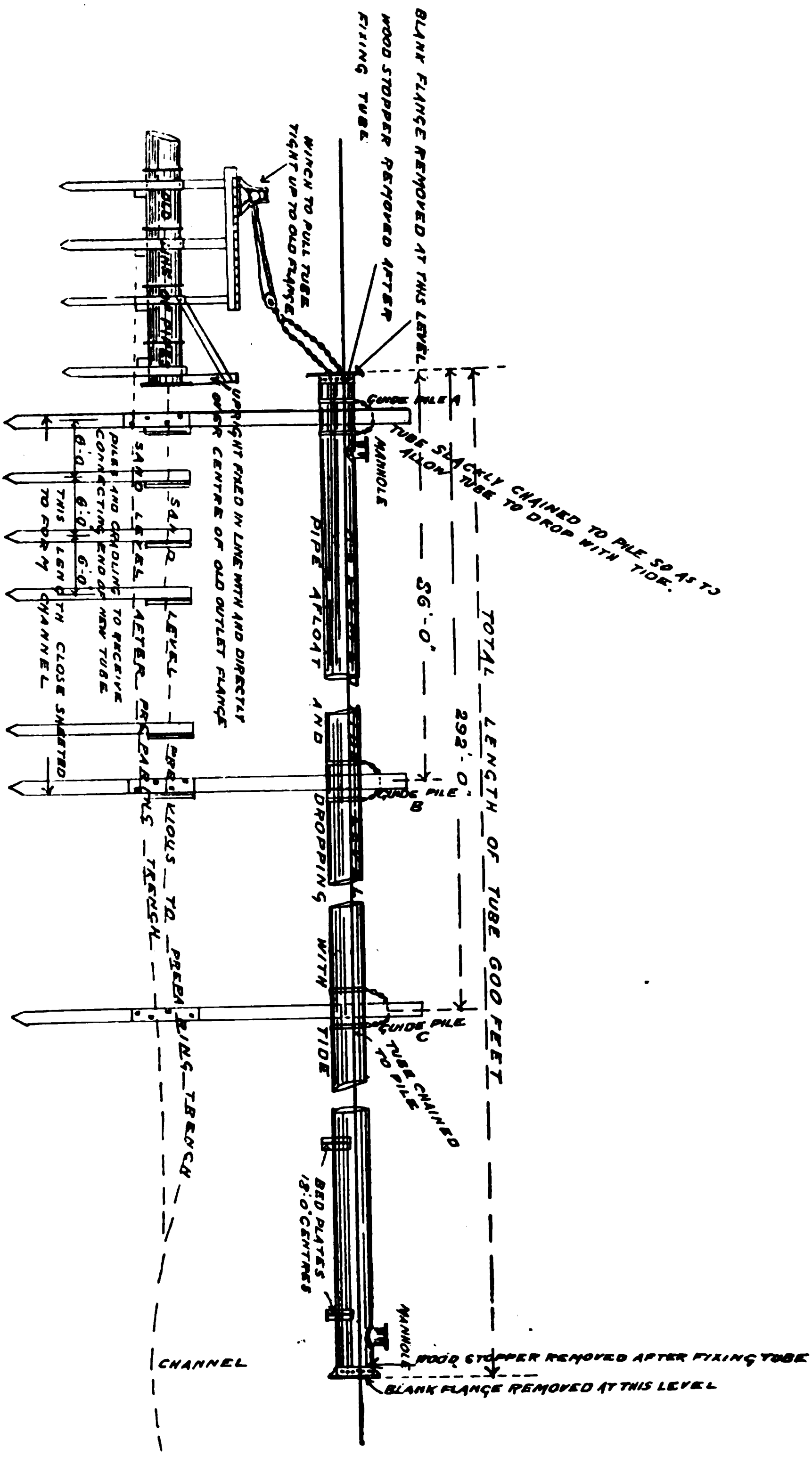


Fig. 3.—LONGITUDINAL SECTION, showing method of dropping Tube in position.

MR. E. R. MATTHEWS (Bridlington) asked if steel tubes had proved satisfactory from the point of view of resistance to corrosion. Mr. Brodie had stated in his paper, that the tubes had been coated "with an improved bituminous preservative." He had not yet met a preservative that had proved satisfactory in resisting the corrosive action of sea-water on cast iron pipes, and the corrosion of steel being much more rapid than that of cast iron, he did not see how the steel tubes could answer satisfactorily.

The use of Karri wood piles was interesting, and he would like to know if this wood had proved satisfactory in the construction of sea works, and if the piles of the old outfall were also of Karri wood.

On page 65 it stated that close timbering was secured to the piles for a distance of 86 feet seawards of the old outlet. He did not see the use of this timbering, and would like to know why it was thus close timbered.

The methods adopted in conveying the 600 feet of pipe to the position of its ultimate destination, and the methods of fixing it, were very interesting. He would like to know what provision was made for the securing of the pipes so that they were not lifted during a storm, and also the distance from L.W.O.S.T. to the new outlet.

MR. H. GILBERT WHYATT (Grimsby) said he might have to carry out a similar work himself in an estuary instead of deep sea. He questioned whether steel was the right material. The cost of the work at Blackpool had been only £1,950. At that rate it might be worth considering whether it would not pay the town to periodically reconstruct instead of meeting the cost of what might be a more permanent undertaking. He wanted to know whether the work was done in one tide or whether the operations occupied two or three tides. The work was stated to have been carried out on a specially high spring tide of 24 ft., which necessarily included a specially low tide. Was the whole length bare at the time, or a part of the pipe dropped into the water at a time and left to take its chance?

MR. T. W. STAINTHORPE (South Africa) mentioned that some years ago he carried a sewer over the foreshore of the river Tees. He made use of cast iron pipes; therefore he asked Mr. Brodie whether he thought he had adopted the right material in steel, and if the Local Government Board approved of it? Also had he considered the question of employing ferro-concrete in place of Karri piles?

MR. C. BROWNRIDGE (Birkenhead) asked what kind of bituminous compound was used for covering the pipe? Also why had he not carried his cradles or slings further towards the end of the piles? Had he had any evidence of the pipes at the end sinking further into the sand, or did the bed plates prevent that? Of course, Mr. Brodie had a special kind of foreshore to deal with; and his method could not be adopted universally in its entirety. What was the depth of the sand, and what was the nature of the subsoil?

Mr. J. S. Munce (Belfast) inquired whether Mr. Brodie was not asked to level the foreshore alongside the pipe. The author of the paper had done the right thing in adopting steel, and instanced a case in his own city in which a saving of £1,500 had been effected by the employment of steel covered with jute in preference to cast iron. Their experience was that steel pipes were far superior to cast iron pipes for foreshore purposes.

The President (Mr. A. D. Greatorex) said he had had occasion lately to relay an important main sewer owing to mining operations. In that work he adopted steel, for the reason that he was anxious to make the sewer act almost like a bridge in the event of future subsidence.

Mr. Brodie said, with regard to the bituminous material employed in coating the pipe, that he took very special care to get the best preservative to be found in 1907. Its efficiency was guaranteed by the makers of the pipes. Since the work was completed he could entirely corroborate what they had said, for the closest examination had failed to indicate on the exterior of the pipes any injury having been done to them. He could not speak as positively with regard to the interior of the pipes, but, as far as they were able to judge by means of the man-holes, there was no indication either of anything having affected the metal. In regard to the piles, they had made use of pitchpine at Blackpool, but the wood was very much worm-eaten, and was being replaced by Karri as occasion arose—which, he was sorry to say, was very frequent. In regard to the timbering for short lengths, that was done in 1907 at the suggestion of the Local Government Board, who proposed they should timber and introduce the steel straps which were made to fit the curvature of the piling merely for purposes of laying. He thought it a very sagacious suggestion on the part of the engineers to the board. The intention was simply to ensure the pipe being laid closely up to and against the surface of the old outfall pipe. They found that it answered as perfectly now as it did in 1907. The pipes had to be laid in one tide or they could not be laid at all. They had one or two false starts (that was to say, they did not float off because of the rough sea), but on a third attempt the sea was sufficiently calm, with a south-east wind blowing, so that the work was done without a hitch. The pipe was towed into position at or near the time of high water, and at the fall of the tide was dropped exactly into the place prepared for it. In the final operations the assistance of a diver was unnecessary, but in any future extension this would be required. With regard to the nature of the subsoil, there were 6 ft. of sand, with a stiff yellow clay underneath. No difficulty was experienced in keeping the pipe ends clear. In reply to Mr. Stainthorpe, the site of the work was not one in which he would have suggested the use of ferro-concrete piles; and as to Mr. Brownridge's question, the cradling was carried to the point it was at the suggestion of the Local Government Board.

The Decomposition of Sterilised and Unsterilised Sewage in Sea-water (Part II.), by J. E. Purvis, M.A., University Lecturer, Corpus Christi College, Cambridge (member), and G. Walker, M.A., M.B., B.C., D.P.H., Trinity College, Cambridge.

The authors have given an account* of the chemical and bacterial changes occurring in sea-water when mixed with sewage; and they also gave a bibliography of the researches of other investigators. In this communication, they desire to submit the results which have been obtained since the former paper was published. The incubations of the various mixtures in that research had been continued for a period of 49 days, and a series of chemical and bacterial analyses of sea-water alone, of a 10 per cent. mixture of sewage and sea-water, and of a 5 per cent. mixture were then described.

Chemically, the chief results were (1) the very slow decomposition and decrease in the two ammonias, even after 49 days' incubation; (2) the appearance of nitrites in the sea-water alone in about 42 days; the appearance of nitrites in the two mixtures in 9 days; their disappearance and their reappearance in about 29 days; their decrease in 42 days in the 10 per cent. mixture; and their disappearance in 42 days in the 5 per cent. mixtures; (3) the appearance of nitrates in the two mixtures after 49 days.

Bacterially, the chief results were that (1) the sea-water contained a definite number of organisms, although, of course, the number was considerably less than in the two mixtures: (2) there was an enormous reduction in the number of organisms by the 21st day; the reduction went on steadily until the 37th day; and the number growing on agar at 37° C. was greater than those growing on gelatine at 22° C., whereas it was the reverse of this at the commencement of the incubations; (3) by the 42nd and the 49th days there was a small *increase* (compared with the 37th day) in the number of organisms capable of growing both on agar at 37° C. and on gelatine at 22° C.; and more particularly in those capable of growing on gelatine at 22° C. This increase in the number of organisms coincides with the appearance of nitrates on the 49th day; and also with the increase of the two ammonias.

In view of these results the authors have continued the observations: and they have also studied the effect of the oxidation of sterilised sewage, and of sterilised sewage mixed with small quantities of the earlier incu-

* *Journ. R. San. I.*, Vol. XXXIII. (1912), p. 368.

bations. The method of continuous aeration at a definite temperature has been described in the previous paper (*loc. cit.*). The following tables contain the results of the chemical analyses under the conditions of a temperature between 14°–18° C., and of continuous and constant aeration.

TABLE A.—*Sea-water alone. The numbers represent parts per 100.000.*

	22nd June (61 days).	6th July (75 days).	20th July (89 days).	6th Aug. (106 days).	15th Aug. (115 days).	4th Oct. (165 days).	15th Oct. (176 days).
Free and Saline NH_3	·075	·08	·017	·03	·016	·02	·015
Albuminoid NH_3	·0065	·04	·010	·022	·020	trace	·070
Total NH_3	·0815	12	·027	·052	·036	·02	.085
N as Nitrites	·0236	nil	·021	·020	nil	nil	nil
N as Nitrates	?? trace	nil	nil	nil	? ·0025	nil	trace

TABLE B.—*Ten per cent. mixture of sewage in sea-water.*

	22nd June (61 days).	6th July (75 days).	20th July (89 days).	6th Aug. (106 days).	15th Aug. (115 days).	4th Oct. (165 days).	15th Oct. (176 days).
Free and Saline NH_3	·030	·20	·150	·170	·130	·05	·20
Albuminoid NH_3	·180	·15	·130	·160	·330	—	·08
Total NH_3	·210	·35	·280	·330	·460	—	·28
N as Nitrites	·0295	trace	·015	·020	trace	nil	nil
N as Nitrates	·0370	1·25	·050	·05	·005	·15	·25

TABLE C.—*Five per cent. mixture of sewage in sea-water.*

	22nd June (61 days).	6th July (75 days).	20th July (89 days).	6th Aug. (106 days)	15th Aug. (115 days).	4th Oct. (165 days)	15th Oct. (176 days).
Free and Saline NH_3..	·03	·15	·050	·150	·050	·15	·13
Albuminoid NH_3	·10	·10	·100	·075	·078	·002	·13
Total NH_3	·13	·25	·150	·225	·128	·152	·26
N as Nitrites	·0236	nil	·018	·018	(very small trace)	nil	nil
N as Nitrates	? trace	·25	trace	trace	·004	? trace	·075

The outstanding results of the above analyses show that (1) the trace of nitrites found in the sea-water above on the 42nd day remained practically the same on the 61st, the 89th, and the 106th day; and that by the 115th day a trace of nitrates appeared, and also on the 176th day: (2) that there was an alternate slow disappearance and re-appearance of both nitrites and nitrates in the two mixtures between the 42nd day and the 115th day; and that by the 176th day both mixtures contained no nitrites, but definite amounts of nitrates: (3) that the sea-water and mixtures contained definite amounts of both ammonias at the end of the 176th day.

The following table contains the results of the bacterial analyses, which, as in the earlier experiments, were limited to the number of organisms which appeared on agar at 37°C. and on gelatine at 22°C.

A = sea-water alone.

B = 5 per cent. mixture of sewage and sea-water.

C = 10 per cent. mixture of sewage and sea-water.

		Number of organisms per cc. capable of developing on agar at 37°C. in 2 days.	Number of organisms per cc. capable of developing on agar at 22°C. in 3 days.
22 June, 1912 (61 days)	A.	62	17
	B.	87	287
	C.	65	760
9 July, 1912 (78 days)	A.	43	22
	B.	75	159
	C.	67	423
22 July, 1912 (89 days)	A.	31	7
	B.	39	129
	C.	58	317
6 August, 1912 (106 days)	A.	19	2
	B.	33	81
	C.	47	208
15 Oct., 1912 (176 days)	A.	A few moulds only.	A few moulds only.
	B.	A few moulds.	A few moulds.
	C.	A few moulds.	A few moulds and 7 colonies.

The outstanding results of the bacterial analyses are the steady decrease in the number of organisms from the slight increase on the 42nd and on the 49th days; and the final disappearance of all the bacteria by the 176th day, with the exception of seven colonies developed in gelatine in the 10 per cent. mixture. There was nothing but moulds left. A comparison of the corresponding chemical results shows that nitrates were present in the mixture by this time.

Sterilised sewage.—Another part of the investigation was to incubate definite portions of sterilised sewage and of sterilised sewage mixed with definite amounts of the 5 per cent. and 10 per cent. mixtures, in order to ascertain how far the decomposition and nitrification is affected in the richer sterilised sewage.

About one litre of fresh sewage was sterilised in an autoclave at 120°C. and 126 lbs. pressure for one hour. Definite volumes of this sterilised sewage were then mixed in the following proportions:—

1. 500 cc. of sterilised sewage were mixed with 500 cc. sterilised distilled water. This is referred to as D in the tables below.

2. 100 cc. of sterilised sewage were mixed with 100 cc. of the 10 per cent. mixture of sewage and sea-water of the earlier incubations, and also with 800 cc. sterilised distilled water. This is referred to as E in the tables below.

3. 50 cc. of the sterilised sewage were mixed with 50 cc. of the 5 per cent. mixture of sewage and sea-water of the earlier incubations, and also with 900 cc. of sterilised distilled water. This is referred to as F in the tables below.

These mixtures were made on the 27th September, 1912, and allowed to incubate as in the earlier observations. That is to say, pure filtered air was aspirated regularly and continuously through them at a definite temperature of 14°–18° C., and they were analysed from time to time chemically and bacterially.

TABLE D.—*Chemical Analysis of the sterilised sewage (see above) in parts per 100.000.*

	28th Sept.	4th Oct. (5 days).	10th Oct. (11 days).	15th Oct. (16 days).	20th Oct. (21 days).	5th Nov. (36 days).
Free and Saline NH_3	1·95	1·95	1·80	not done	·30	·30
Albuminoid NH_3	·20	·20	·25	,,	·20	·25
Total NH_3	2·15	2·15	2·05	,,	·50	·55
N as Nitrites	nil	·059	·09	·147	·251	·225
N as Nitrates	nil	nil	? ? trace	·150	·450	·900

TABLE E.—*Chemical Analysis of sterilised sewage to which a portion of the old 10 per cent. mixture had been added (see above).*

	28th Sept.	4th Oct. (5 days).	10th Oct. (11 days).	15th Oct. (16 days).	20th Oct. (21 days).	4th Nov. (36 days).
Free and Saline NH_3	5·5	6·0	5·4	not done	·2	·13
Albuminoid NH_3	1·0	1·5	2·2	,,	·15	·05
Total NH_3	6·5	7·5	7·7	,,	·35	·18
N as Nitrites	trace	·0118	·13	·005	? trace	·0003
N as Nitrates	? ? trace	? ? trace	·10	·200	·45	·75

TABLE F.—*Chemical analysis of the sterilised sewage to which a portion of the old 5 per cent. mixture had been added (see above).*

	28th Sept.	4th Oct. (5 days).	10th Oct. (11 days).	15th Oct. (16 days).	20th Oct. (21 days).	4th Nov. (36 days).
Free and Saline NH_3	3·0	1·8	1·4	not done	·15	·08
Albuminoid NH_3	1·0	1·0	1·0	...	·08	nil
Total NH_3	4·0	2·8	2·4	...	·23	·98
N as Nitrites	small trace	·004	·06	·009	? trace	·0001
N as Nitrates	? trace	nil	? trace	·002	·05	·09

The results of the above tables D, E, and F clearly show that nitrites are first produced slowly in all three solutions, and that this is followed by the production of nitrates. At the same time the total ammonia figure is also reduced. That is to say, the oxidation of *sterilised* sewage results in the *production of nitrites and nitrates, without the assistance of bacteria,* as shown by table D.

The following table contains the results of the bacterial analyses of the above mixtures D, E, F.

		No. of organisms per cc. capable of developing on agar at 37° C. in 2 days.	No. of organisms per cc. capable of developing on gelatine at 22° C. in three days.
28 Sept., 1912	D.	No colonies; 2 proteus	No bacterial colonies; 1 mould
	E.	7 „ 3 „	11 colonies; no moulds
	F.	1 colony 2 „	No „ 3 moulds
7 Oct., 1912	D.	1 colony ...	... No „ 1 proteus
	E.	35 colonies ...	... 368 „
	F.	11 „ ...	... 224 „
10 Oct., 1912	D.	No colonies ...	... 1 colony
	E.	19 „ ...	... 320 colonies
	F.	11 „ ...	... 218 „
15 Oct., 1912	D.	No colonies ...	... No colonies
	E.	8 „ ...	... 215 „
	F.	2 „ ...	... 93 „
22 Oct., 1912	D.	No colonies ...	... No colonies
	E.	11 „ ...	... 148 „
	F.	1 colony ...	... 27 „
4 Nov., 1912	D.	No colonies ...	... No colonies
	E.	3 „ ...	... 107 „
	F.	1 colony ...	... 18 „

The most striking result of the above table is to show that no bacterial colonies appeared in the sterilised sewage; and that in the sterilised sewage which had been inoculated with small quantities of the old 5 per cent. and 10 per cent. incubations the number of colonies slightly increased between the date of the inoculation (28th September) and 9 days afterwards, and gradually decreased after that date.

If these numbers are compared with the chemical analyses of the 4th November it will be seen that there were considerable amounts of nitrites and nitrates in the sterilised sewage, and *that not a single bacterial colony was found.*

Results.—To sum up the results of these investigations, it is clear that whilst nitrites and nitrates are produced there is also a reduction in the number of bacteria. The first series of experiments with unsterilised

sewage indicates that, although the number of organisms decreases, the oxidation of the nitrogenous compounds is not diminished. In the second series of experiments with sterilised sewage, it is proved that nitrites and nitrates are produced even when no bacteria are present; and although there is a slight increase in the number of organisms in the 5 per cent. and 10 per cent. incubations, no doubt caused by the fresh food which has been added, the numbers gradually decrease, and at the end nitrites and nitrates are present in considerable amounts.

The whole series of experiments proves that *where thorough aëration goes on in mixtures of sewage and sea-water, the production of nitrites and nitrates need not, and is not, brought about by the action of the nitrifying organisms.* It is a reasonable explanation to suggest that the dissolved oxygen slowly breaks down the complex compounds in sewage; and that, in course of time, nitrites and nitrates are amongst the final products of this slow oxidation. The salts in the sea-water are antagonistic to the growth of bacteria, the latter gradually die out, and amongst them, most probably, are the useful nitrifying organisms. The result is that a rapid oxidation of the complex chemical compounds is impossible; and it is only slowly brought about by the dissolved oxygen of the air which is gradually used up in the process, and is replenished by the systematic solution of the oxygen of the atmosphere.

The effect of the high temperature and pressure in the sterilised sewage experiments would be to break down the organic compounds to a considerable extent, and thereby the oxidation would proceed more rapidly than in the unsterilised sewage.

The application of these results to the disposal of sewage in the sea or in estuaries or lakes is direct. The growth and development of useful nitrifying organisms is impossible; and the decomposition and breakdown of the complex organic compounds is slowly accomplished by the oxygen dissolved in the larger body of water, whether it be the sea or a lake. This oxygen is soon used up by the first lot of sewage; and it is only by the continuous solution of more oxygen from the atmosphere that the decomposition can proceed. Consequently, the final production of nitrates in this way is a very slow process. An important point to bear in mind is, therefore, the necessity of thorough and rapid dilution of the sewage or effluent when these are poured into the waters of the sea or an estuary, even after they have undergone some preliminary treatment. A more rapid and efficient oxidation is thereby assured.

The Purification of the Water of Swimming Baths. Report of a Committee of The Royal Sanitary Institute, consisting of LOUIS C. PARKES, M.D., D.P.H., Chairman; PHILIP BOOBBYER, M.D., M.S.; COL. J. LANE NOTTER, M.A., M.D., R.A.M.C.; S. RIDEAL, D.SC., F.I.C.; A. SAXON SNELL, F.R.I.B.A.; H. D. SEARLES-WOOD, F.R.I.B.A.; and W. C. TYNDALE, M.Inst.C.E. November, 1912.

THE water of swimming ponds, which are frequented daily by many bathers, becomes highly charged with bacterial organisms as a result of such use. Thus it has been found that a fresh-water pond containing 100,000 gallons in use for one day only, but which had been used by 380 bathers, contained 342,400 bacteria per cubic centimetre of water at the end of the day, the average number of bacteria in the clean water used to fill the pond being less than 500 per cubic centimetre.

No doubt the great majority of such bacteria, which must have been in large part derived from the bodies of bathers, are harmless non-pathogenic organisms. But there will always be a certain residuum of organisms which have disease-producing powers when placed in an environment suitable to their growth and development. The water of a much-used swimming pond must contain organisms from the mouth, nose and throat, and probably also from the intestinal and urinary tracts of the bathers. Dr. Graham Forbes has identified in the water of a used swimming pond, organisms derived from the skin and from the saliva of bathers, and also the characteristic organisms of the bowel. When highly diluted and intermixed with the large volumes of clean water, these possibly harmful organisms, even when swallowed by bathers, are probably too few in number to originate disease. There is, at any rate, very little, if any, evidence at present pointing to such diseases as enteric fever, scarlet fever, diphtheria, sore throat, influenza, tuberculosis, ophthalmia, nasal catarrh, otorrhœa, measles, and whooping cough being originated in this manner.* Having regard to the large numbers of children using public swimming baths, many of whom must be very susceptible to the infections of one or another of these diseases, it is surprising that no evidence of such a mode of transmission should have been forthcoming, if infection at swimming baths was at all a common occurrence.

On the other hand infection may occur occasionally, and the mode of

* It has been suggested that acute poliomyelitis can be transmitted through swimming baths, the infection being present in the nasal and pharyngeal secretions of infected persons and of "carriers."

transmission may not be recognised, as the act of bathing in a swimming pond would not be thought of at all in this connection.

There can also be little doubt that not all the bacteria derived from the bodies of bathers are likely to be distributed evenly through the bulk of the pond water. Many of them are entangled in tenacious mucus from the nose and throat, which is not at all readily broken up and intermixed with large volumes of water. It is quite easy to conceive that an unfortunate bather might receive into his mouth, and swallow the recently ejected mucus discharges from a person suffering from sore throat or influenza, or recovering from these or other diseases, and as a result fall a victim to the disease. In such a case quite a massive infection would be produced, and the belief that extreme dilution of harmful organisms would prevent any possibility of infection would be unwarranted.

The noses and ears of bathers may very easily receive infection in a similar manner, and catarrhal or septic conditions supervene.

That some of the bacterial impurity of the pond water is suspended in solid matters is evident from the formation of scum in water which has been bathed in, this scum floating on the surface of the water. Slimy sediment and slimy deposits are also to be found on the side walls and floor of the pond at its deeper end, the slimy ingredient being probably the mucus and epithelium from the bodies of the bathers. The water, too, becomes opaque, the opacity being due to minute particles of organic matter with their associated bacteria. The water loses its fresh smell, and in time will develop the distinctive odour of humanity.

The warmth of the water (70° F. in winter) is very favourable to the multiplication of bacteria, and this possibly accounts for the large numbers found in the water of a pond which has been in use for some days.

As a result of these changes in the water, apart altogether from the question of infection, an unpleasant smell becomes noticeable in the air over a swimming pond, and this, with the associated warmth of the bath and the general absence of efficient ventilation, causes the lassitude and weariness so often complained of as following a swim in a public bath.

The rapidity with which swimming pond-water will become polluted must naturally depend not only on the numbers, but also on the class of people who make use of it. A pond which is bathed in by persons who never have a bath at home, and who spit and urinate in the bath water, will much more rapidly deteriorate in quality than the first class pond which is used only by cleanly persons.

There can be no doubt that where a pond is extensively used by uncleanly persons, the water should be changed daily, and the walls and

floor of the pond freed from sedimentary collections. Ponds used by girls and women, for reasons which need not be particularised, require to have the water changed more frequently than where males only are accommodated. In no case during the summer bathing season, when large numbers are using the baths, should the pond water be changed less frequently than every other day.

This constant change of water implies heavy costs, and various systems have been recommended and practically applied for submitting the water to some purifying process so as to obviate the expense involved in frequent changes of water.

From the evidence collected by the Committee it would appear that the "continuous aeration and filtration" plants,* now so largely adopted, are effective to a certain extent in preventing the gross pollution that results where a pond water is in continuous daily use without change. The higher grades of bacterial pollution are prevented, and the water is maintained comparatively clear and free from odour, but there is nothing approaching sterilisation of the water, nor is the latter free from turbidity. It is evident that the comparatively small amount of aeration the water of a pond can be submitted to by this process, and the limited capacity of the filters through which the water is strained, can have no very great effect if restoration of the water to its original state of purity is the object aimed at. That these continuous aeration and filtration plants have a very considerable effect is undoubted, and they enable a swimming pond to be used without any apparent bad effects for a very considerable time without a complete change of water; but it must not be supposed that the water is necessarily of so good a quality as that which comes in from the mains of a town; and it must also be remembered that, if the water of a pond is changed only at long intervals, there will be a considerable accretion of slimy matters on the walls and floors, which is a very undesirable adjunct of a swimming bath.

The Committee has also investigated the treatment of bath water by electrolytic fluid, which is in use at the Poplar baths, and was very much impressed with the good results obtained. By the addition of hypochlorite of magnesia solution to the pond water in amount sufficient to give one part of free chlorine to every one or two million parts of water, not only is the water sterilised, or deprived of all organised living molecules, but it is

* At Belfast, at the public baths, continuous aeration and filtration is combined with a precipitant, the solution of the latter being added to the water on its way to the filter. The bacteriological results from the use of this system are reported to be good, *B. coli* being invariably absent in the filtered water.

kept sweet and free from odour, and there is no tendency in the water to the deposition of slimy sediments on the floor of the pond. A certain amount of slimy matter collects on the walls of the pond at the line where the surface of the water is in continual movement from the undulatory motions induced by the movements of bathers, but this is readily removed with a swab by an attendant.

At Poplar, the hypochlorite of magnesia solution is prepared by the electrolysis of Water Board water, containing certain definite proportions of sodium chloride and magnesium chloride. An elaborate plant has been erected, as the electrolysis fluid is largely used in the Borough of Poplar as a disinfectant. Sea-water would serve equally well for the manufacture of hypochlorite solution, as its chief constituents are the chlorides of sodium and of magnesium. It is quite unnecessary, however, to erect a plant for the manufacture of hypochlorite solutions, as these can be obtained as commercial products from the manufacturers of chlorinated disinfectants.

It should be said that the electrolytic fluid in the Poplar Baths is not used with idea of rendering unnecessary periodic changes of the pond water, but to keep the water in the pond fresh and free from harmful organisms all the time it is in use. The class of persons who use the swimming ponds in Poplar is always likely to contain uncleanly or infected individuals, and it is to guard against danger from the latter that the fluid finds its chief application.

At Poplar the electrolytic fluid costs in its preparation about £2 per 1,000 gallons, or a little less than ½d. per gallon. Thirty gallons are added to a swimming pond of 85,000 capacity on first filling, and subsequent additions are made as required, at intervals of two or three days. The bath is emptied weekly or every ten days.

Volume XXXIV. No. 2. Issued March, 1913.

JOURNAL

OF

THE ROYAL SANITARY INSTITUTE

CONGRESS AT YORK.

CONFERENCE OF MEDICAL OFFICERS OF HEALTH.

Presidential Address, by Professor A. BOSTOCK HILL, M.Sc., M.D. D.P.H. (FELLOW.)

I HAVE shown elsewhere that the medical officer of health has been evolved by a natural process, and that a public conception of his duties has been the natural one due to gradual development of sanitary science, public opinion and legislation. As a result of these factors, he is, to a considerable extent at least, still held in public estimation as a sort of superior inspector of nuisances, for the particular reason that the public idea of modern sanitation has not advanced *pro rata* with the science, and because also, the public notion of hygiene has progressed little beyond the idea of good drains. It may not be out of place, therefore, for a few moments to consider his present position and his future.

When we speak of the medical officer of health, we are apt to consider all medical officers of health as having to perform similar duties. We forget that while the older medical officers are advisory and executive officers to sanitary authorities the county medical officer of health is an advisor to a body which at present has but little direct sanitary work to carry out, but is placed in the position rather of a supervising authority. Though it is more than twenty years since the office of the county medical officer of health was established, it was only by the passing of the Housing and Town Planning Act that he became a statutory officer with a fixity of tenure, while, in accordance with the powers given to it, the Local Government Board has since drawn up and issued a schedule of

duties which, undoubtedly, will be the commencement of an enlarged sphere of work.

In the early history of the county medical officer, it was rather the custom to regard him as holding a position much to be envied, as one having an ample salary with little real work. Indeed, it has been somewhat unkindly stated that one of his chief duties was to find himself suitable employment. Undoubtedly, in some cases, it was the desire of a few at least of those bodies who appointed him, that he should not by his energy lead them into fresh fields and pastures new, which they had no present desire to explore. Of late, however, a great change has taken place. Public health is now rapidly becoming one of the great national problems to be dealt with, and Lord Beaconsfield's perversion of vanitas vanitatum is now assuming an importance little dreamed of when it was uttered. Perhaps only in one instance has the medical officer of health a really enviable position, namely, in the large cities and towns, where, with a well-equipped department, he is the adviser and executive officer on all matters affecting the public health. His colleagues in the urban and rural districts are very differently situated. Except in a few instances, their capacities are not utilized as they might be. Their reports are sometimes looked forward to with apprehension, and in many instances means are taken to prevent them having opportunities of tendering advice which may lead to increased expenditure. I have known of cases where it has been intimated to the medical officer of health of a small district, that his attendance is not desired at the monthly meetings of the Council, the idea being, presumably, that the least said the soonest mended, and that the evil day of expenditure on sanitary improvements may be put off as long as possible.

Whether or not we are still in the position to rightly say "thank God we have a House of Lords," I am not quite sure, but there is certainly evidence of late coming to hand, that we may congratulate ourselves in hygienic circles that we have a Local Government Board, for the Board has recently in many cases shown a very welcome desire to stimulate a certain type of Council whose sanitary education has not yet sufficiently advanced. The capacity of the Local Government Board, however, must of necessity be limited, and though we all admire the excellent and scientific work so well accomplished, and though we all look with thankfulness to the guidance and help we get from its accomplished staff, is it not now a fair question to ask, has not the time come when a change may be made in the method of administration of sanitary work in the small districts, particularly in relation to the County Councils? Would

it not be better first to relieve the Local Government Board of much of its detail in supervisory work, and give its staff more time for dealing with the many problems now awaiting solution?

The County Councils in every case are now compelled to have a Public Health Committee and Department. They must all have a skilled sanitary adviser who will regularise and systematise his work so that he may be brought more intimately into touch with the local areas, and thus they must be brought directly within the administrative sphere of County Council government. These districts may, I think, be properly regarded as filling the same places as do the wards of the large municipalities, and although it may be urged that geographical difficulties would occur, these might easily be surmounted and urban and rural administration placed on a better basis, both as regards efficiency in work and economy in finance.

The number of Councils which have shown themselves eager to accept sanitary responsibilities is not a large one. Of late years Parliament has been by no means sparing in placing burdens on the County Councils. They may adopt the Notification of Births Act, and thus take a share in the complex work associated with infant life; they deal with the medical inspection of school children, and may deal also with the amelioration of the defects discovered; they administer the Food and Drugs Act and certain collateral ones, as well as the work of prevention of the pollution of rivers, consequently they are in touch with the sewerage and sewage disposal of the districts; they have power to deal with Isolation Hospitals and the formation of Hospital Boards; they are closely associated with the housing under the new Act, and may, under certain circumstances, be called upon to take action under some of its clauses; they also have to deal with the midwives, and are responsible for the supervision of their methods of practice. In many instances too they have established bacterial laboratories, or have made arrangements whereby valuable information is placed at the disposal of the local sanitary authorities, while during the last few months they have been designated as the proper authorities to deal with the new and most important work, the problem of the prevention and cure of consumption. Has not then the time arrived when they should be invested with the power to administer the whole of the county sanitary legislation? There are, of course, many difficulties in the way, and perhaps one of the most important is the danger of doing away with what has been termed "local patriotism." This is not, however, more important in matters hygienic than in the case of law and order, or of education, and these matters are dealt with

centrally for each county. Health, dealing as it does, not only with the comfort and prosperity of the people, but with life itself, is surely equally important with law and order and education, and I believe it is only because people have not yet realised the true meaning of health that they are content for it to remain in a position subsidiary to less important considerations.

The positions of existing officers must be safeguarded, and this can be achieved in many instances by making them officers of the county, or in other instances by compensating them for loss of office. As appointments fall vacant, schemes might be introduced whereby improved co-ordination could be effected so that all sanitary work in the county area could be dealt with as a complete entity, and a sanitary service in the full sense of the term instituted. In connection with this an important point may be mentioned. In many instances the general administrative work of the county has been crippled, at all events for a time, by the best paying districts in the counties being annexed as they have developed by large municipalities, to which they are adjacent. There is of course no disguising the fact that the developmont of these portions of the county has been due chiefly to the propinquity of the district to the urban area, but I do think sufficient force has not, in the past, been given to the argument that while these districts have belonged to the county area they have required an advanced policy of administration which it is extremely difficult to carry on when the best parts of the county area, in a rateable sense, have been removed from it, leaving only larger areas of undeveloped districts to be administered. There is a sign now that this view will be adopted by Parliament, so that in the future the large municipalities when they desire to annex portions of the county territory, must compensate the County Council for the difficulties and expenses thus caused in the administration of the less productive areas.

If such a state of affairs as has been foreshadowed in relation to county areas were brought about, the general status of the medical officer of health would be raised enormously. The service would be consolidated, and a marked improvement in efficiency of administration, as well as economy, would ensue. Everyone holding office would be specially trained for his special work, and an improved co-ordination would result.

Owing to the evolution of the science of hygiene, the conception of the duties of the medical officer of health is becoming enlarged. His duty is to take charge of the individual as an infant, even to some extent perhaps before he comes into the world, in that the importance of the prospective mother's health is now being considered, and the training of midwives is

being improved. The medical officer now follows the child to school and protects him afterwards as an adult, in his house and in his workshop. He protects him also as far as possible, and to a large extent, from the ravages of infectious diseases. He is about to take charge of him if he shows signs of phthisis, while finally, he pilots him through the shoals of later life till he reaches an advanced age. How much wider a conception of the duties of the medical officer of health is shown here than is suggested by the Public Health Act, and yet there are signs that the ideal is not a great way from realisation.

In reply to the question as to what are we waiting for, I have no hesitation in saying that it is education in hygiene. Education of the people to an appreciation of what is ready for them to accept, and I hold that at the present time the most important work waiting for the medical officer of health is that of taking a foremost place in this education. It is because I hold this view that I have taken during the last few months so great an interest in the institution of a National Health Week, and though I was surprised as much as gratified by the extraordinary success of the first health week held in the spring, I feel that an opportunity is now before the medical officers of health in the country to co-operate in the work which is destined to affect the welfare of the public to a degree not yet fully appreciated. In the celebration of the first national health week, many medical officers of health took a worthy part, and in every case, both metropolitan and provincial, where this happened, the success of the celebration was manifest. The next national health week is provisionally fixed to commence on April 6th, 1913, and I feel particularly anxious that an opportunity should not be lost by my brother officers of taking their position as the instructors of the public as to the true condition of affairs.

Many of my friends have been a little alarmed at the idea of such a celebration. They say, why do we want another influence at work in this respect? Have we not our congresses and our conferences? Do we not, by means of our elementary teachers, do something to teach the child the blessings of health? To this I would reply, that all this is perfectly true. The idea of health week is simply as a co-ordination of existing forces without the institution of any new society or body, the utilisation of the various forces, whose efforts, when taken singly, do not yield the amount of good which is possible if they all work together for a particular purpose at a special time. The idea of health week, therefore, is not only for the few professional men and teachers to urge their views on particular subjects, but to call the attention of the people as a whole to the achieve-

ments of sanitation in the few years it has been scientifically worked; to the triumphs which have been won over pestilences, plagues, and fevers; to the work still remaining to be done, and to the results which may be so easily realized in the future.

This work means something more than the mere performance of our statutory duties. It means taking such steps as will produce a widespread interest in all, and an appreciation of the fact that though we have vanquished the black death, the sweating sickness, and the plague, there is still consumption carrying off one-tenth of our population, while other so-called preventable diseases are, taken together, responsible for nearly a similar rate of mortality.

We want also to show that, great as is the preventable mortality, this is not the total of the bill we have to pay. For every case of preventable death innumerable cases of sickness arise, which might be reduced to a very large extent if hygienic knowledge were as widespread as it might be. The means of spreading this knowledge is one of the difficulties we have to contend with, but that is all the more reason why, by virtue of our official position, we should assume responsibilities and take the requisite steps to co-ordinate the work of existing agencies, thus showing what has always been the case in the eyes of the sanitary profession, *Salus populi suprema lex.*

The Theory of Probable Error and its Application to Vital Statistics, by JOHN BROWNLEE, M.D., D.Sc., Physician Superintendent, City of Glasgow Fever Hospital, Ruchill.

1. WITH the increase of the use of statistics in public health it is becoming increasingly important that an accurate knowledge of the processes by which results are arrived at should be in the hands of all working with figures. The theory of error was originally developed in connection with games of chance, further developed to suit the requirements of astronomy, and contemporaneously applied from a different point of view to the construction of life tables. In recent years these two applications have converged, till it is now possible to apply many results deduced from the theory of chance to the discussion of problems which could formerly only be attacked by the method of finite differences.

2. Modern mathematical analysis has developed very specially three branches. It has greatly extended the application of the method of curve-fitting to smooth observations. It has brought into use a large number of methods for calculating the correlation between different qualities. It has also concerned itself largely with the discussion of probable error. It is this last branch I intend to treat chiefly to-day.

3. This subject falls naturally into four divisions:—I. The error due to random selection; II. The assumptions on which the mathematical proofs are based and the modifications required; III. The influence of experimental error; and IV. The method of testing how far theory and observation agree.

I.

4. The subject of probable error due to random sampling is as a rule dismissed in public health text books with a simple statement of Poisson's Formula, or with a treatment which almost wholly neglects the limitations of its application. The mathematics, however, required for its understanding is not very advanced. The general theorem which is of most importance can be found proved in any elementary text book of Algebra, and is as follows. If p be the chance of an event happening and q that of it failing to happen so that $(p+q)=1$, that is, either the event happens or it fails, then in n trials the chance of its happening $(n-m)$ times and failing m times is given by the $(m+1)^{th}$ term of the binomial expansion of $(p+q)^n$

$$\text{or of } p^n + np^{n-1}q + \frac{n(n-1)}{1.2}p^{n-2}q^2 + \frac{n(n-1)(n-2)}{1.2.3}p^{n-3}q^3 \ldots.$$

$$\text{that is } \frac{n(n-1)\ldots\ldots(n-m+1)}{1.2\ldots.m}p^{n-m}q^m$$

If $p = q$ this expression is symmetrical, and the chances of the event happening m times is the same as that of it failing m times, the formula in this case becoming $(\frac{1}{2} + \frac{1}{2})^n$. It is to be noted that as $p + q$ is equal to unity $(p + q)^n$ is also equal to unity, and that if we have M cases the distribution is given by $M(p + q)^n$.

5. Many distributions are described very approximately by one or other of these formulæ. Thus stature, head breadth, head length, cephalic Index, etc., are very closely represented by $(\frac{1}{2} + \frac{1}{2})^n$, while such cases as the number of persons suffering from enteric fever at each age period, etc., are described by the formula $(p + q)^n$. But these distributions are not as a rule used in the forms above given. Certain curves which can be calculated much more simply have been found to represent these formulæ very closely.

Thus $(\frac{1}{2} + \frac{1}{2})^n$ is represented

by $y = y_1 e^{-\frac{x^2}{2\sigma^2}}$, commonly called the "Normal Curve of Error,"

and $(p + q)^n$ by $y = y_0 z^p e^{-\gamma x}$ known to statisticians as Type III.

6. The method in which the form $(\frac{1}{2} + \frac{1}{2})^n$ arises is of special interest. It is commonly derived from the analogy of coin tossing. Only heads or tails can occur, and the chance of either is equal. Thus, if we toss a single coin a large number of times, in the end approximately equal proportions of heads and tails will ensue. If we toss two coins together a large number of times, two heads or two tails will each occur once, and a head and a tail twice, approximately, out of every four times the coins are spun. If n coins be spun the chance of each combination of heads and tails is given by the terms of the binomial expression $(\frac{1}{2} + \frac{1}{2})^n$.

It is to be noted here that the chances are quite independent of each other, as a head or a tail is equally probable at each separate experiment. If a head in excess denote a positive error, and a tail a negative, we find that not only are the errors independent, but positive and negative errors of like size occur with equal frequency. But there is no necessity in nature for the odds to be equal on both sides. If we take a six-sided die, for instance, six can only be thrown once on the average for five times the other numbers are thrown. If we take n dice, then the proportion in which the sixes will turn up are given by the terms of the expression $(\frac{1}{6} + \frac{5}{6})^n$, n sixes turning up only once in 6^n times.

7. Certain quantities are specially important. The mean of the observations is one of these, this being regularly used in all statistical work for

purposes of comparison. The next most important is the standard deviation, which is the square root of the second moment taken round a vertical line through the mean, and which is equivalent in dynamics to the radius of gyration.

The mean may be defined as the average value of the quantities considered. It is obtained by multiplying the size of each unit by the number of times it occurs, taking the sum of all such values and dividing this sum by the total number of units considered. Thus, if the size a occurs m times, and the size b, n times, the mean is given by $\frac{ma + nb}{m + n}$

If more sizes exist, and the sum be denoted by Σ as usual, then the mean is given by $\frac{\Sigma\, ma}{\Sigma\, m}$

8. In the case of $(p+q)^n$ the mean can readily be found. Suppose the expression expanded as before, and suppose that the frequency value p^n corresponds to the value of the size h, and $p^{n-1}q$ to the value $(h+a)$, etc., where a is the increase of value in passing from one term to the next, then we have at once, as corresponding to the expression Σma,

$$p^n h + np^{n-1} q(h+a) + \frac{n(n-1)}{1\cdot 2} p^{n-2} q^2 (h+2a) + \dots .$$

which equals $p^n h + n p^{n-1} q h + \frac{n(n-1)}{1\cdot 2} p^{n-2} q^2 h + \dots .$

$$+ n a p^{n-1} q + n(n-1) a p^{n-2} q^2 + \frac{n(n-1)(n-2)}{1\cdot 2} a p^{n-3} q^3 + \dots .$$

$$= h(p+q)^n + naq\,(p+q)^{n-1}$$

$$\therefore \text{ Mean } = \frac{h(p+q)^n + naq\,(p+q)^{n-1}}{(p+q)^n}$$

$$= h + naq \quad \text{since } (p+q) = 1.$$

The mean may obviously be calculated as a distance from any origin; it is usual, however, in practice, to calculate it from some point in the middle of the series of observations, as will be presently shown.

9. In a similar way the second moment is calculated. This is usually denoted by μ_2. In this case we multiply the terms by h^2, $(h+a)^2$, ... instead of by h, $h+a$ ..... This gives for the separate terms

$$\mu_2(p+q)^n = p^n h^2 + np^{n-1}q(h+a)^2 + \frac{n(n-1)}{1.2} p^{n-2} q(h+2a)^2 + \dots .$$

$$= h^2(p+q)^n$$

$$+ 2ahnq(p+q)^{n-1}$$

$$+ a^2 nq \left\{ p^{n-1} + (n-1)\, 2p^{n-2}q + \frac{(n-1)(n-2)}{1.2} 3\, p^{n-3} q^2 + \dots . \right.$$

As the last expression is equal to

$$a^2nq\,(p+q)^{n-1}$$
$$+\,a^2n(n-1)q^2(p+q)^{n-2}$$
$$\mu_2 = h^2 + 2ahnq + a^2nq + a^2n(n-1)q^2$$

This is the second moment taken about a vertical line at distance $h + naq$ from the centre of gravity.

10. Supposing now that the origin is at the centre of gravity instead of the position formerly assumed, it follows that $h + naq = 0$. If we substitute then $h = -naq$ in the formula for the second moment, we have as the value of that moment round a vertical line through the centre of gravity or the mean

$$h^2 + 2ahnq + a^2nq + a^2n^2q^2 - a^2nq^2 \text{ when } h = -anq$$
$$= a^2nq - a^2nq^2 = a^2nq(1-q) = a^2npq$$

The standard deviation, usually denoted by σ, is equal to the square root of this, and is therefore $a\sqrt{npq}$, or $\sqrt{npq}$ if a be taken as unity, as is usually done. In general to calculate the second moment round the ordinate through the centre of gravity, which for shortness is called "centroid verticle," the distance of the mean from some suitable origin and the second moment round the same origin are calculated. If these are denoted by ν_1 and ν_2 respectively, then $\sigma^2 = \nu_2 - \nu_1{}^2$, which is easily seen to be the case by a modification of the proof given above, for if the last formula hold

$$\sigma^2 = h^2 + 2ahnq + a^2nq^2 + a^2n(n-1)q^2 - (h + anq)^2$$
$$= a^2nq(1-q)$$
$$= a^2npq, \text{ as already found.}$$

11. As an example, take the number of deaths in each series of one hundred cases of scarlet fever. Here out of thirty instances the deaths ranged from 0 to 6, as seen below.

No. of Deaths.	No. of Instances.	Multipliers.		
0	1	−3	−3	9
1	6	−2	−12	24
2	6	−1	−6	6
3	9	0	−21	39
4	4	1	4	4
5	3	2	6	12
6	1	3	3	9
	30		13	25
			−21	39
			−8	64

The origin has been taken at 3 deaths and the abscissæ measured positively and negatively from this point. The products for the first

and second moments are then found and added together, having regard to sign. So that we have

$$\nu_1 = -\frac{8}{30}$$

$$\nu_2 = \frac{64}{30}$$

$$\text{So that } \sigma^2 = \frac{64}{30} - \left(\frac{8}{30}\right)^2$$

$$= 2{\cdot}062$$

$$\text{or } \sigma = 1{\cdot}436$$

Since $\nu_1 = -\frac{8}{30}$, the mean number of deaths in each hundred cases is equal to $3 - \frac{8}{30} = 2{\cdot}73$, since 3 deaths has been chosen as the point of origin. This is in general much the simplest way of calculating the mean and the standard deviation.

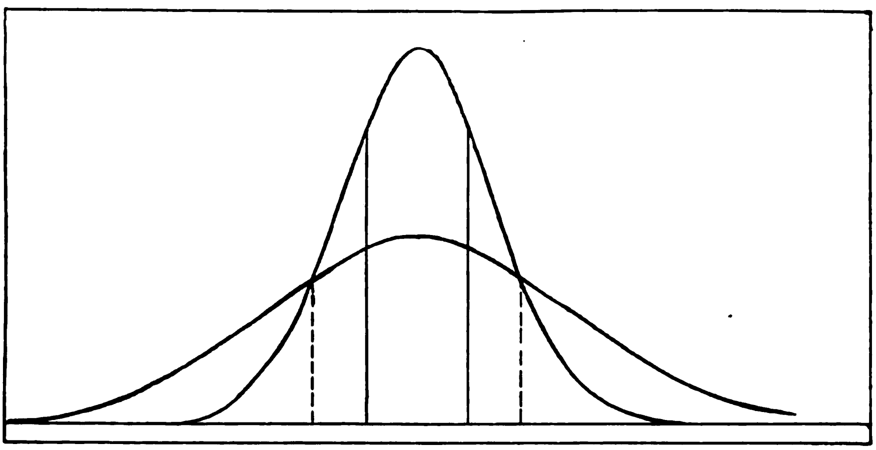


Diagram illustrating the meaning of probable error. The two curves shown have the same area, but the standard deviation of the lower is twice that of the upper. The continuous vertical lines divide the upper curve into parts, so that the centre area is equal to the sum of the two external portions, and the chain lines do the same for the flatter curve, showing that the greater the standard deviation the greater the probable error.

12. The significance of the standard deviation can be best seen when two normal curves of equal area are compared. This is shown in the diagram. Both these curves relate to the same number of cases, N.

The equation of the first is $y = \frac{N}{\sqrt{2\pi}} e^{\frac{-x^2}{2}}$

and of the second, $y = \frac{N}{2\sqrt{2\pi}} e^{\frac{-x^2}{8}}$

The standard deviation of the first is unity, and of the second two. It is seen at once that a much greater variation of values takes place in the second than in the first, or that a very much smaller proportion of cases having the mean properties is found. In other words, the larger the standard deviation the less likely it is that the mean value obtained from the observations represents a large proportion of the values.

13. The definition of the term "probable error" can now be given. It has been determined by this use of the "normal" curve to describe the variations due to error in observation. If we divide the area of the curve into three portions, *viz.*, one limited by two ordinates each equidistant from the middle line, and two portions external to these ordinates; so that the area of the central portion is equal to twice the area of either of the external portions, it can be calculated that the distance of the ordinates from the middle line is $\cdot 67449\ \sigma$. This is termed the probable error, and it signifies that the chances of an observation falling into the central portion or into one or other of the external portions are equal.

14. When the curve is asymmetrical, that is, when it is derived from $(p+q)^n$, where p is not equal to q, the standard deviation still has a significance as indicating the degree of "scatter," but it can no longer be used to measure the deviation on both sides of the mean. The mode or most probable value is now no longer coincident with the mean, but lies more or less to one side of it.

15. The probable error has in itself little practical use, since no inference can be drawn where the odds are equal. The common rule is to take three times the probable error as indicating the point at which a conclusion may be taken as fairly probable, but it is better to avoid using the term "probable error" and consider only the standard deviation, which, as twice the standard deviation is almost exactly equal to three times the probable error, occasions no change of argument, and only a small change of nomenclature. In this connection the standard deviation may well be called the "standard error," as is done by Mr. Yule. In the accompanying table (Table I.) are shown the chances of the observation lying within the area of the curve limited by distances from the mid-line $\pm \cdot 5\sigma$, $\pm \sigma$, $\pm 1 \cdot 5\sigma$, etc., and the approximate values of the chance of failure in fractions. If the standard deviation itself is used the odds are two to one in favour of the actual figures lying within the area bounded by $y = \pm \sigma$; if twice the standard deviation be taken, the usual limit, these rise to 21 to 1, while if three times the standard deviation be used they rise to 369 to 1. Even in the latter instance, however, the odds must not be considered overwhelming.

TABLE I.—*Showing the Chances that the Actual Observation lies within* $y = \pm n\sigma$.

n	Chances of success.	Approximate chances of failure.
·5	·3829	$\frac{2}{3}$
1·0	·6827	$\frac{1}{3}$
1·5	·8664	$\frac{1}{7}$
2·0	·9545	$\frac{1}{22}$
2·5	·9876	$\frac{1}{81}$
3·0	·9973	$\frac{1}{370}$

16. Before making application of what has been said, it will be well to observe more particularly what happens when samples of a population are drawn: (1) theoretically, and (2) in actual instances.

The theory of chance gives us two formulæ. If we draw M samples of, say, r individuals from the very large population, the proportion p of which consist of one class, and the proportion q of the remainder, then the numbers in which the different proportions of p and q occur are given by the several terms of the expression, $M(p+q)^r$. If, however, the number from which samples may be drawn is limited say to n, p and q remaining as before, the proportions of the different populations are given by the terms of

$$1 + \frac{r}{1} \cdot \frac{qn}{pn - r + 1} + \frac{r(r-1)}{1 \cdot 2} \frac{qn(qn-1)}{(pn - r + 1)(pn - r + 2)} + \dots.$$

17. These are abstract problems, but such problems appear regularly in public health statistics. I have had a series of these investigated. In the case of scarlet fever, Belvidere Hospital (1900–1912); scarlet fever, Ruchill Hospital (1909–1912); enteric fever, Belvidere and Ruchill Hospitals (1900–1912); and diphtheria, Ruchill Hospital, (1909–1912), all the cases have been tabulated in consecutive groups of 100 to 200 cases (Table II.). In each of these groups the even numbers of the hospital register have been kept separate from the odd numbers. It is thus possible to compare the mortalities of groups of cases admitted at the same time and selected from each other only after an interval of years by a method as absolutely fair as seems possible.

18. Take as a first instance the drawing of samples of 50 from a general population which is divided into two portions in the proportions

TABLE II.—*Showing the Number of Deaths in Parallel Series of Cases chosen so that the Alternate Cases fall into Different Groups.*

Scarlet Fever,* Belvidere, 1900—1908. 4,700 cases.				Enteric Fever,* Belvidere and Ruchill, 1900—1912, 1,900 cases.		Diphtheria,† Ruchill, 1909—1912, 1,800 cases.		Scarlet Fever,† Ruchill, 1909—1912. 2,900 cases.	
1	–	2	1	12	8	10	13	4	3
2	–	1	2	11	6	7	7	5	3
1	3	3	2	10	10	6	9	1	2
1	3	3	–	10	6	10	4	2	3
3	–	2	6	11	14	13	10	3	4
3	–	2	2	14	5	8	12	1	3
3	1	–	1	9	9	14	11	6	5
1	–	2	4	6	5	9	9	2	4
2	1	1	4	15	5	11	12	3‡	1‡
5	4	–	3	4	6			2	1
1	3	3	2	9	10			1	–
3	2	2	3	10	6			4	2
1	4	–	1	9	19			3	3
4	1	2	2	10	14			3	2
3	2	–	1	10	15			5	1
2	7	1	1	10	7				
3	2	2	1	10	5				
3	3	3	1	8	8				
1	4	4	5	7	7				
3	3	7	4	6	7				
1	3	2	1						
2	1	2	1						
3	2	1	2						
3	4								

* Each figure denotes the number of deaths in 50 cases.
† Each figure denotes the number of deaths in 100 cases.
‡ Each 80 cases.

of 18 to 82. The result of M trials is given by the terms of the expansion

$$M\left(\frac{82}{100} + \frac{18}{100}\right)^{50}$$

$$\text{Or } M \left\{\left(\frac{82}{100}\right)^{50} + 50\left(\frac{82}{100}\right)^{49}\frac{18}{100} + \frac{50 \cdot 49}{1 \cdot 2}\left(\frac{82}{100}\right)^{48}\left(\frac{18}{100}\right)^{2} + \cdots\cdots\right.$$

This expansion includes the case of the groups of enteric fever where the mortality has been on the average 18 per cent. Thirty-eight groups of fifties occur. The numbers of these groups with each definite number of deaths are given in the adjoining table and compared with the numbers obtained from the expression given above. The fit is not good, but if they be grouped in larger classes, namely 0-3 deaths, 4-7 deaths, etc., the theoretical and the actual numbers show a good correspondence. (Table IV.)

TABLE III.—*Showing the Actual Number of Groups of* 50 *Cases of Enteric Fever (Belvidere and Ruchill Hospitals) which contain a Definite Number of Deaths compared with Expectation.*

Number of Deaths.	Number of Groups with x Deaths.	Number of Groups Expected Theoretically.
0	-	·–
1	-	·–
2	-	·1
3	·–	·4
4	1	1·0
5	4	2·1
6	5	3.5
7	3	4·5
8	4	5·4
9	3	5·5
10	9	5·0
11	2	4·0
12	1	2·8
13	·–	1·8
14	3	1·0
15	2	.5
16	·–	·26
17	·–	·12
18	·–	·05
19	1	·02
20	1	·01
21	·–	·00

TABLE IV.

No. of Deaths.	Actual.	Theoretical.
0—3	0	·5
4—7	13	11·1
8—11	18	19·9
12—15	6	6·1
16—19	1	·47
	38	38·07

TABLE V.—*Scarlet Fever, Ruchill Hospital.*

Number of Deaths.	Number Expected.	Number Found.	Difference.	Difference Squared Divided by Theoretical Numbers.
0	1·83	1	·83	·38
1	5·34	6	·66	·08
2	7·41	6	1·41	·27
3	6·85	9	2·15	·70
4	4·66	4	·66	·10
5	2·47	3	·53	1·13
6	1·06	1	·06	·00
7	·38	—	—	—
8	·11	—	—	—
	30·11	30·00	—	2·64

19. It is not at all clear, however, that we should draw from an infinite class. The consecutive cases of scarlet fever in Ruchill number 2,960 with 82 deaths. Taking these numbers the relative proportions of samples of 100 of different constitution can easily be calculated (par. 16). These numbers are shown below and compared with those actually found. (Table V.)

It is a very good fit considering the small number of the observations. A similar table is given for Belvidere. Here in the earlier period the mortality was much higher, 203 deaths taking place in 4,700 cases. The variation in groups of 50 cases is considered. The actual and theoretical figures are given in Table VI.

TABLE VI.—*Scarlet Fever, Belvidere Hospital.*

Number of Deaths.	Theoretical.	Actual	Difference.	Difference Squared Divided by Theoretical Numbers.
0	10·4	10	·4	·00
1	23·4	25	1·6	·11
2	25·8	23	2·8	·30
3	18·7	22	3·3	·59
4	9·8	9	·8	·07
5	4·0	2	2·0	1·00
6	1·3 } ·4 } 1.7	1 } 2 } 3	1·3	1·00
	93·8	94		3·07

These figures show a very fair correspondence between fact and theory. Possibly the fit might be better or might be worse with larger numbers, for in the figures as given there is a correlation between high numbers of deaths or low numbers of deaths in the corresponding fifties or hundreds to be expected as the fevers vary somewhat in severity from period to period, but the numbers are not sufficient to determine the amount definitely.

20. We are now in a position to explain the proof of the chief theorem in probable error as applied to vital statistics. The problem is: if we have a population of N individuals consisting of s groups $y_1, y_2, \ldots y_s$, to find the standard deviation of the group y_p. The chance of one individual being drawn from this group is evidently $\frac{y_p}{N}$, and likewise the chance of his not being drawn is $1 - \frac{y_p}{N}$. If then m individuals have been selected by chance the proportional distributions will be represented, as has been seen before, by the terms of the expansion of $\left\{\frac{y_p}{N} + \left(1 - \frac{y_p}{N}\right)\right\}^m$ the standard

deviation of which is $\sqrt{m\frac{y_p}{N}\left(1-\frac{y_p}{N}\right)}$. Now we do not know the ratio of y_p to N. All that is known is the ratio which the samples of these quantities bear to each other. We may, however, assume, subject to subsequent investigation, that these ratios are for practical purposes identical, keeping in mind that this at present is only an assumption. If then y'_p denotes the actual number of y_p found, we have the standard deviation of the error of y_p since the total number of observations is m, represented by $\sqrt{m\frac{y_p'}{m}\left(1-\frac{y_p'}{m}\right)}$ or suppressing the accents by $\sqrt{\frac{y_p(m-y_p)}{m}}$

21. To make clearer the meaning of the formula just found it is applied to the example given before (par. 19) regarding the actual groups found of 4,700 cases of scarlet fever. The mean death-rate and the standard deviation of these, calculated as in the example (par. 11) are found to be $M = 2{\cdot}16$ and $\sigma = 1{\cdot}475$. With the formula just given

$$\sigma = \sqrt{\frac{2{\cdot}16\quad(50-2{\cdot}16)}{50}} = 1{\cdot}437$$

It must be noted that the grouping is quite asymmetric, nearly twice as many cases occurring on the one side of the mean as on the other, so that a smaller value of the death-rate than that given by the mean is twice as probable as one that is larger. A second application is made to deaths in each series of 100 cases of scarlet fever seen in Ruchill Hospital. Here, as we have already seen (par. 11) $\sigma = 1{\cdot}436$, the average number of deaths per hundred is $2{\cdot}73$, so that we have by the formula of standard error $\sigma = \sqrt{\frac{2{\cdot}73\quad(100-2{\cdot}73)}{100}} = \sqrt{2{\cdot}658} = 1{\cdot}630$, or in this case the actual range found is considerably less than that expected theoretically.

22. The method in which the standard error varies can best be observed by considering actual figures. In the next two tables (Tables VII.–VIII.) two sets of values of the standard error are given. The first values given are the absolute values. Thus, if from the column showing the number of cases 5,000 is chosen, the corresponding value of the standard error when the death-rate is 5 per cent. is seen to be 15·411; a 5 per cent. mortality in 5,000 cases means 250 deaths. Twice the standard error is 30·8, so that the odds are 21 to 1 that the real number of deaths lies between 220 and 281. The figure in the same place in the second table is ·308. This is the standard error of the percentage death-rate, or the odds are again 21 to 1 that the true percentage death-rate lies between 4·382 and 5·616 if the death-rate is based on 5,000 cases.

TABLE VII.—*Showing the Value of the Standard Error* of the Number of Deaths *for Different Percentage Death-Rates when the Number of Cases Increases.*

No. of Cases.	Percentage Mortality.									
	1 p.c.	2 p.c.	3 p.c.	4 p.c.	5 p.c.	10 p.c.	20 p.c.	30 p.c.	40 p.c.	50 p.c.
100	·995	1·400	1·706	1·960	2·179	3·000	4·000	4·583	4·899	5·000
500	2·225	3·131	3·815	4·382	4·874	6·708	8·944	10·247	11·045	11·180
1,000	3·146	4·427	5·394	6·197	6·892	9·487	12·649	14·491	15·492	15·811
5,000	7·036	9·900	12·063	13·586	15·411	21·331	28·284	32·404	34·641	35·355
10,000	9·95	14·00	17·06	19·60	21·79	30·000	40·000	45·83	48·99	50·00

TABLE VIII.—*Showing the Value of the Standard Error* of the Percentage Death-Rate *when the Number of Cases Increases.*

No. of Cases.	Percentage Mortality.									
	1 p.c.	2 p.c.	3 p.c.	4 p.c.	5 p.c.	10 p.c.	20 p.c.	30 p.c.	40 p.c.	50 p.c.
100	·995	1·400	1·706	1·960	2·179	3·000	4·000	4·583	4·899	5·000
500	·445	·626	·763	·872	·975	1·341	1·788	2·050	2·209	2·236
1,000	·315	·443	·539	·620	·689	·949	1·265	1·449	1·549	1·581
5,000	·121	·198	·241	·271	·308	·426	·566	·648	·693	·707
10,000	·100	·140	·171	·196	·218	·300	·400	·458	·490	·500

23. Several facts are easily seen in considering these tables. First the standard error increases with the increasing percentage mortality, rising from ·995 in the first row when the percentage is unity, to 5·000 when the percentage is 50; but relatively to the percentage itself it steadily decreases. Twice the standard error when the percentage is 3 gives values $3 \pm 3{\cdot}4$ for the limits, which will be exceeded once in every 22 times, while the same limits when the percentage is 40 are $40 \pm 9{\cdot}798$. The first instance tells us little; while the last suggests that a severe mortality must be the rule.

24. It is also to be noted that very large numbers give little more certainty than more moderate numbers. Considering the last two rows in Table VIII., it is seen that the standard error is only reduced by about 15 per cent. when the mortality is 1 per cent., and about 29 per cent. when the mortality is 50 per cent. as the numbers increase from 5,000 to 10,000.

TABLE IX.—*Showing the Number of Deaths in each Series of 200 or 400 Cases.*

Scarlet Fever,* Belvidere.		Scarlet Fever,* Ruchill.		Enteric Fever,† Belvidere and Ruchill.		Diphtheria,† Ruchill.	
Even.	Odd.	Even.	Odd.	Even.	Odd.	Even.	Odd.
15	7	12	11	43	30	13	16
21	24	12	16	40	33	21	13
19	22	10	4	38	27	20	22
15	18	11‡	6‡	39	55		
9	17						

* Each figure is the deaths in 400 cases. † Each figure is the deaths in 200 cases.
‡ Each figure is the deaths in 300 cases.

25. One more table is given to show how the death-rate may actually vary in fairly large numbers. In each instance 400 or 200 cases are compared with 400 or 200 parallel cases, the first the even number in the registers and the second the odd; the differences are surprising. 200, in the case of enteric fever or of diphtheria, is a large number; 400, in the instance of scarlet fever, not a small number, yet had any treatment been the subject of investigation and the alternate cases taken, the one for treatment and the other for control, very erroneous conclusions could easily have been advanced.

26. One more formula may be given without discussion. It is the standard error of the mean. The proof involves principles not discussed in this paper, but the result can easily be understood. If h be the mean of the number of observations and σ the standard deviation of these observations, h and σ being calculated as described in par. 11, then the standard error of the mean $= \frac{\sigma}{\sqrt{m}}$, when m is the total number of observations.

This signifies that if we are comparing the means of two series of observations, no conclusion can be deemed even moderately definite unless the differences between the two means is greater than $\frac{2\sigma}{\sqrt{m}}$

II.

In the proof of the standard error given in par. 20 an assumption was made, namely, that the proportions of the sample which had been found by random selection might be considered as equivalent to those existing in the general population. Now in this case all the information in our possession can be stated mathematically by saying that an event has happened m times, and failed n times. From this the probable constitution of the

universe must be deduced. This problem was first considered by Bayes, and the solution is known as Bayes' Theorem. The proof is difficult, but the formula is easily understood. If m deaths and n recoveries have taken place, the different populations from which these may have been drawn have the relative probabilities given by the areas of the successive strips of the curve. $y = x^m (1-x)^n$, or if the total chance be denoted by unity, the chance of each type of population existing is

$$\frac{x^m (1-x)^n \, dx}{\int_0^1 x^m (1-x)^n \, dx}$$

For practical purposes the ordinates at any points roughly give the relative probabilities. Thus, if 3 represent the number of deaths found in 100 cases, and 97 the number of recoveries, the probabilities that the general population possesses *1* per cent., *2* per cent., *3* per cent. death-rates, etc., are given by substituting these values for m, n and x respectively in the above formula, and are:— $(\cdot 01)^3 \quad (1-\cdot 01)^{97} \quad (\cdot 02)^3 (1-\cdot 02)^{97} \quad (\cdot 03)^3 \quad (1-\cdot 03)^{97}$, etc.

The figures are given in the adjoining table (Table X). For comparison the values obtained by the same formula where $m=30$ and $n=970$ (figures which express the same death-rate in a larger number of cases) are arranged in a parallel column:—

TABLE X.—*Showing the Chances of Each Constitution of the Population when the Sample Contains* (1) *3 of one kind* (a) *to 97 of the other* (b) *and* (2) *30 of* (a) *to 970 of* (b).

Percentage of (a) in the Constitution of the Sample.	(1) Relative Size of Ordinates of $x^3 (1-x)^{97}$	(2) Relative Size of Ordinates of $x^{30} (1-x)^{970}$
0	·70	·000
1	3·77	·000
1·5	—	·083
2	11·28	3·342
2·5	—	18·548
3	14·06	30·235
3·5	—	20·711
4	12·37	10·085
4·5	—	3·135
5	8·63	·228
6	5·35	·002
7	3·01	—
8	1·62	—
9	·78	—
10	·36	—
11	·16	—
12	·07	—

It is seen, in the first instance, that a population constituted so as to possess a four per cent. mortality is about equally as probable as one constituted to possess a three per cent. mortality, and that a two per cent. mortality is only a little less probable. It is also evident that populations with mortalities of five and six per cent. will occur once in every seven and twelve times respectively. Little can therefore be surmised concerning the constitution of the population from information based on one hundred observations. When one thousand cases, however, are considered, the range is much less, as is seen in the table. The probability rises to nearly $\frac{2}{3}$rds, but even here a population with a four per cent. constitution will occur more than once for every three times the sample represents the population accurately.

This problem is distinctly different from that considered in the previous pages. It seeks to find the constitution of the general population from the sample, that previously considered to find the probable constitution of the sample when the type of the population is known. The standard deviations are therefore different. In the present instance

$$\sigma^2=\frac{(m+1)\ (n+1)\ (m+n)^2}{(m+n+3)\ \ (m+n+2)^2}$$

which is larger than the corresponding value of the standard error of a sample, most markedly so when m and n are small, but very closely approximating when the values are greater. Thus, for $m=3$ $n=97$ the values of the two standard errors are 1·91 and 1·71 respectively, while for $m=30$ $n=970$ the corresponding figures are 5·46 and 5·39.

With 100 cases the limits given by twice the standard error are $3 \pm 3{\cdot}8$, with 1,000 cases $30 \pm 10{\cdot}92$, giving a range of percentage 0 to 6·8 in the former case and 1·9 to 4·1 in the latter. Such are the limitations of the assumption on which the proof given in par. 20 depends.

The two theorems may, however, be combined. The proof is given by Prof. Pearson in the *Philosophical Magazine*, Mar., 1907: the results only concern us here.

If m and n are the numbers of each kind found in the sample, and if the next sample number q, then the standard deviation with samples of number q is given by

$$\sigma^2=\frac{q\ (m+1)\ \ (n+1)\ \ (m+n+q+2)}{(m+n+2)^2\ (m+n+3)}$$

If $q=m+n$, *i.e.*, if the standard deviation of m or n in samples numbering $m+n$ is desired, then

$$\sigma^2=\frac{2(m+n)\ (m+1)\ (n+1)\ (m+n+1)}{(m+n+2)^2\ (m+n+3)}.$$

which is approximately equal to $\frac{2mn}{m+n}$ if m and n be large, or a formula similar to Poisson's is arrived at, though the two are not really comparable, as they have been obtained on quite different premises.

If q be unequal to $m+n$, but both numbers large, the formula becomes

$$\sigma^2 = q^2 \frac{mn}{(m+n)^2} \left\{ \frac{1}{m+n} + \frac{1}{q} \right\}$$

This shows that if $m+n$ be small compared with q, the standard deviation does not become smaller with the increase of q, or we cannot predict a large from a small sample, but only the opposite, the latter reason explaining why the standard deviations obtained experimentally in the earlier part of this paper (par. 21) are in so close accord with the ordinary theory.

The formulæ in this section, however, are those which should be used to check the validity of conclusions drawn from figures.

An example will make this easier to understand. Let the first series of cases be 100, namely, 40 of one class and 60 of the other, and let it be desired to find the standard error in a second series of 1,000 cases.

Here $\quad m = 40, \quad n = 60, \quad q = 1{,}000$

so that $\quad \sigma^2 = \frac{1{,}000^2 \times 40 \times 60}{100^2} \left\{ \frac{1}{100} + \frac{1}{1{,}000} \right\}$

$$= 2{,}640$$

or $\quad \sigma = 51{\cdot}4$

In 1,000 cases 400 cases are to be expected if the proportions of the first sample are preserved so that $400 \pm 51{\cdot}4 \times 2$ are the limits, as before described. Were there 1,000 cases in the first sample with 600 of one type and 400 of the other the standard error would be given by

$$\sigma^2 = \frac{1{,}000^2 \times 400 \times 600}{1{,}000^2} \left\{ \frac{1}{1{,}000} + \frac{1}{1{,}000} \right\}$$

$$= 480 \quad \text{or } \sigma = 21{\cdot}9$$

or the standard error is less than one-half of that in the previous instance.

Apart from tables these formulæ are of difficult application, as the distributions are so markedly skew or asymmetrical, the variation in one direction being much greater than in the other, and the mean not giving the most probable value. Actual calculation in individual cases is very laborious.

III.

The errors due to random selection of the population have been fully discussed, but there is yet one other type of error which is not usually given sufficient weight in actual statistical work, that is, the error due to imper-

fection of technique. This appears in a variety of ways, in the case of the astronomer in the slight difference between one observation and another, in the case of the marksman in the number of inners or outers he makes in comparison with the number of bulls eyes. All human measurements are liable to a certain amount of error variable in different individuals, but in the end more or less describable in each separate individual by some definite law.

Public health statistics seem at first sight comparatively free from such errors. We have a certain number of deaths and each of these represents a fact. But even weekly death-rates are far from certain apart altogether from the random selection of deaths in each week. As five days are allowed for the certification of a death, a few wet days at the end of a week may throw many certifications from one week into the next. Even such a comparatively simple matter as the number of deaths from a disease has a large experimental error. Out of the 2,960 cases of scarlet fever which were treated in Ruchill Hospital as before described, 82 deaths occurred. Of these, 5 could not definitely be ascribed to the fever, occurring associated with conditions which themselves were not likely to be fatal, but which the double disease made specially dangerous. This is a fair number as the standard error of 82 deaths in 2,960 cases is 8·9, so that the experimental error is more than half of this. On such large numbers, however, it may be neglected. In the groups each of 200 cases, however, it appears in the following manner and might easily lead to false reasoning.

Total Deaths.	Experimental Error.
8	1
11	1
4	1
3	1
6	1

I feel convinced that this is an under and not an over estimate.

In some examples which have been before me lately in another branch of science, the experimental error is for each separate observation very large, and this case is worth considering. If we have a limited number of observations, each of which we know is open to a large experimental error, we may consider the matter in this way. Let the observations have values $x_1\ x_2\ x_3\ \ldots\ x_n$, let the mean be h.

$$\text{So that } h = \frac{1}{n}(x_1 + x_2 + x_3 + \ldots\ldots \quad x_n)$$

let the standard deviation of each term be σ, and let it be required to know the standard deviation of h.

This is found to be $\frac{\sigma}{\sqrt{m}}$, the same result as that given in par. 26: σ, however, is not the "standard error" due to random sampling, but the "standard error" of the experimental error, the result being derived by a different process of reasoning. It is easily seen that a difference exists, for if we have two groups of quantities with the same disposition in statistical series, one which can be measured exactly and the other only inexactly, the error of the mean from random sampling will be the same in both cases, but the experimental error will greatly differ. This part of the subject I intend to develop more fully later when I am in possession of the requisite public health data.

IV.

The theorem of this section is due to Prof. Pearson and furnishes a very useful criterion as to whether groups of statistics really fulfil certain conditions with reasonable probability. The proof of the theorem is very difficult and need not even be outlined, but the application, given a table of the function, is very easy. The method of calculation is as follows:— If there be an actual distribution and a theoretical distribution, the difference of the values actual and theoretical of each term is to be taken, squared and divided by the corresponding theoretical value. These values are then summed. This sum is denoted by χ^2. A table of the function is then consulted. In this the value of P is tabulated according to the values of χ^2 and of n the number of terms compared, P being the probability that in a certain number of trials a worse fit than the theoretical values will be found. In paragraph 19 two examples have been given. In Table V. we find that $\chi^2=2{\cdot}64$. The number of terms compared is seven. We then consult the table and find $\chi^2=2$ gives $P={\cdot}920$ and $\chi^2=3$, $P={\cdot}809$ whence $\chi^2=2{\cdot}64$ gives approximately $P={\cdot}849$, or in 849 random trials out of one thousand a worse fit between theory and observation would occur. In the second sample $\chi^2=3{\cdot}07$. Hence the value of $P={\cdot}8$ approximately, or in 8 trials out of 10 a worse result would be found. In other words, theory and observation are in good correspondence.

A third example is taken from one of my old hospital reports, 1903-4. The question to be ascertained was if there was any special day or series of days on which children sickened from scarlet fever. The days of the week on which 907 children at school ages sickened during the months of August and September, 1901-1904 were tabulated. These months were chosen as being the epidemic months, and also the months immediately after the holidays, when many susceptible children go to the school for the first time. If there be any special evidence of school infection, it

should be seen in a variation in the numbers sickening on different days, as the schools do not meet on either Saturday or Sunday. The figures are given in the adjoining table in which also the application of the method is shown. The theoretical value to be tested here is obviously the mean number of all the cases namely $\frac{1}{7} \times 907$ or 129·6.

TABLE XI.—*Showing Days of Sickening in 907 Cases of Scarlet Fever.*

		No. of Cases.	Theoretical Value.	Difference.	(Difference)^2	$\frac{(\text{Difference})^2}{\text{Theoretical Value.}}$
Sunday	...	124	129·6	–5·6	31·36	·24
Monday	...	143	129·6	13·4	179·56	1·38
Tuesday	...	117	129·6	-12·6	158·76	1·22
Wednesday	...	134	129·6	4·4	19·36	·15
Thursday	...	120	129·6	–9·6	92·16	·71
Friday	...	143	129·6	13·4	179·56	1·38
Saturday	...	126	129·6	–3·6	12·96	·10
Total	...	907	907	000	673·72	5·18

Thus $\chi^2 = 5{\cdot}18$ or $P = {\cdot}522$ or in half the trials made as much divergence would be found, so that there is little evidence from this source that scarlatina is spread by schools.

As tables of this function are rather inaccessible, I have constructed a short table from a diagram in my note-book. It does not profess to be more than a first approximation, and it is constructed on this principle. If the probability be less than ·1 it is of not much practical public health use. The probabilities have, therefore, been given in the top line in

TABLE XII.—*Showing the Values of χ^2 for certain Values of P and n.*

N	Values of *P*.								
	·9	·8	·7	·6	·5	·4	·3	·2	·1
3	—	—	·7	1·0	1·2	1·8	2·4	3·4	4·6
4	—	1·00	1·4	1·9	2·4	2·9	3·6	4·6	6·1
5	1·0	1·7	2·2	2·8	3·4	4·1	4·9	5·9	7·7
6	1·6	2·3	3·0	3·6	4·3	5·1	6·0	7·3	9·2
7	2·2	3·0	3·8	4·6	5·3	6·2	7·2	8·6	10·5
8	2·9	3·8	4·7	5·4	6·3	7·3	8·4	9·7	12·0
9	3·5	4·6	5·5	6·4	7·4	8·4	9·5	11·0	13·2
10	4·2	5·4	6·4	7·4	8·4	9·4	10·6	12·2	14·6
12	5·6	7·0	8·2	9·3	10·4	11·5	12·8	14·5	17·2
14	7·0	8·7	9·9	11·1	12·3	13·6	15·1	16·9	19·6
16	8·6	10·3	11·8	13·0	14·4	15·7	16·3	19·3	22·3

values from ·1, ·2, · · · to ·9. The number of instances compared is in the first verticle column. The value of χ^2, which gives each of these values, is tabulated. We can then see at a glance the probability of the result. As the value of χ^2 and the value of n are known, the probability can at once be placed between two adjacent decimals of unity, which is quite close enough for all practical purposes.

DR. S. G. MOSTYN (Darlington) said a busy medical officer of health had little time to search among original papers for information on a rapidly growing subject such as that which Dr. Brownlee was discussing, and a debt of gratitude was due to Dr. Brownlee for his work. It was important always to state clearly the quantity which each mathematical symbol or expression was intended to represent; in some recent work on statistical subjects there had been a want of clear definition of the terms used. In applying mathematical methods to any natural question it was important to see that the analysis was co-extensive with the problem; that was not the case in Prof. Pearson's recent lecture, and by comparing the results obtained with those of skilful, experienced, and respected workers in public health, a "personal equation" could be obtained for the newer methods and those who are applying them.

DR. F. B. W. PHILLIPS (Bedford), said Prof. Pearson's methods of analysis formed a valuable check upon loose ways of drawing sweeping conclusions from scanty data. Medical officers should give some study to these modern statistical methods.

DR. P. BOOBBYER (Nottingham) said the occupation of back-to-back houses and the neglect of personal cleanliness were not in every instance attended by consequences, morally, physically, or socially injurious, but it was surely self-evident that overcrowding, lack of fresh air and sunlight, and uncleanliness, especially in situations where dirt was often highly infective, were in the long run, and where large numbers were concerned, in all these ways distinctly hurtful to the subjects of them. So far as the crude death-rate was concerned, this was often entirely unreliable as a test of sanitary fitness of dwellings, or the opposite. The high-class hotel, and some vile back-to-back common lodging-houses he knew of in another city, were both caravanserais with constantly shifting inmates, and both were innocent of death-rates, but no sensible person would argue from this that the common lodging houses were as good and safe as the hotel to live in.

Ophthalmia Neonatorum, by GEORGE REID, M.D., D.P.H., County Medical Officer, Staffordshire County Council (FELLOW).

THERE is no longer any need to adduce arguments for providing machinery for dealing with cases of ophthalmia neonatorum in order to prevent the disastrous results which are likely to follow from neglect or delay in the treatment of such cases. The question has lately received considerable attention, and it is generally accepted that the disease has been the direct cause of about one-third the cases of permanent blindness in the country.

No one doubts the fact that the disease is peculiarly amenable to curative treatment if employed early enough, and my main object is to show what has been accomplished in certain districts where schemes for providing such treatment have been in operation for some time, and to indicate the essential requirements if success is to be achieved. I am not able to give as full an account as I should like of the results so far obtained, because the machinery has been in operation for so short a time in many districts, and also this paper had to be written before many of the annual reports of medical officers of health of large towns for last year were available. Certain medical officers of health, however, have been good enough to supply me with special information which is both interesting and instructive, and I am hopeful that it will be supplemented to-day by those who have had experience in this work but who have not yet published the results of their experience.

The most complete returns I have were very kindly supplied by Dr. Petgrave Johnson, the Medical Officer of Health of Stoke-on-Trent where compulsory notification of the disease has been in operation, and machinery for its treatment has been provided.

The procedure varies according as to whether the case is notified by a midwife or a medical man. In the former case the circumstances are immediately enquired into and, if a medical man has not already been called in, the persons responsible for the care of the child are urged and encouraged to provide medical help. The medical officer of health is empowered to supply any nursing assistance which may be necessary, either on the report of the health visitor who makes the enquiry, or, subsequently, on the application of any medical man who may be called to the case. On the other hand, if the case is reported by a medical man, no enquiry is made into the circumstances, but he is informed that on receipt of a request from him to the effect that the services of a nurse or nurses are desirable, both day and night nurses if necessary will immediately be

supplied, at the cost of the authority, to carry out his directions as regards treatment.

Dr. Johnson has been good enough to supply me with figures relating to the working of the scheme during the year 1911, and the following are the chief facts regarding the cases enquired into, which include all the cases notified with thirteen exceptions, namely, three in which the diagnosis proved to be wrong, and ten which, at the request of the medical men attending, were not investigated.

Among 7,367 births, 246 cases were notified, and 233 were enquired into as regards the full circumstances; nurses were supplied for 89 cases, 36 per cent. of the whole, at a total cost of £263, or about £2 19s. 0d. per case nursed. Working out this sum on a basis of population, the cost of nursing per 1,000 amounted to £1 2s. 5d.

In 90 per cent. of the nursed cases, day nurses only were supplied, for an average period of 10·2 days; in 9 per cent. both day and night nurses were provided for an average period respectively of 11 days and 6·4 nights; and in one case a night nurse only was supplied for five nights.

In the following table, figures are given showing the number of notifications by doctors and midwives respectively, and, so far as circumstances permitted, the result of the enquiries made as regards the number affected in one or both eyes, and the degree of severity of the cases:

Cases Notified and Degree of Severity.

Births.	Notifications.			Cases per 1,000 births.	Eyes affected.*		Degree.*	
	Doctor.	Midwife.	Total.		One.	Both.	Slight.	Severe.
7367	65	181	246	33·4	75	158	139	94

From the above it will be seen that in 68 per cent. of the cases both eyes were affected, and that in 40 per cent. the type of disease was said to have been severe. In the following table, figures are set forth showing the results as regards the termination of the cases:

*Results of Treatment.**

SLIGHT CASES.					SEVERE CASES.				
Total.	Recovered.	Blind.	Died.	Left District.	Total.	Recovered.	Blind.		Died.
							One eye.	Both eyes.	
139	132	Nil.	5	2	94	84	3	2	5

* Omitting three cases of mistaken diagnosis, and ten cases not inquired into at request of medical attendant.

It will be noticed that no blindness is recorded in the case of the 139 slight cases. The five deaths which took place resulted from causes entirely unconnected with ophthalmia, namely, four from premature birth, and one from congenital debility.

As regards the ninety-four severe cases, eighty-four recovered, three lost the sight of one eye, and two became totally blind; the causes of death in the case of the five children who died were: congenital debility, three cases; measles, one case; and bronchitis, one case.

The following histories relating to the five cases in which treatment failed either partially or entirely are of interest, as indicating in what respect a scheme of treatment requires tightening up if complete success is to be acheived.

As regards the two children who lost the sight of both eyes, there was needless delay in bringing the machinery into operation. Case A. was notified by a midwife on March 20th, the disease having shown itself the previous day, but the case was not seen by a doctor until March 22nd, and his notification was delayed until March 24th, when he intimated that nursing assistance would not be required. A nurse was supplied, however, the following day, and ultimately the child was taken to the ophthalmic wards of a local infirmary. It will thus be seen that in this case six days elapsed from the onset of the disease until the day when a nurse was supplied.

As regards case B., the disease manifested itself on August 3rd, and was notified by the midwife the same day. The child was seen by a doctor the following day, who notified at once, but the notification did not reach the health offices until the following day, when a nurse was supplied. In this case two days elapsed between the onset of the disease and the supply of a nurse.

As regards the three cases which resulted in blindness in one eye: Case A. the midwife failed to notify, with the result that six days elapsed before medical attendance was obtained, and four days before a nurse was supplied. Case B., the onset was on August 10th, but the midwife did not notify until the 12th, when the patient was seen by a doctor and a day nurse was supplied; two days later a night nurse was also supplied. Case C.: in this case, owing to neglect to notify on the part of the midwife, the eyes had been affected for twenty days before a doctor was called in and a nurse supplied on his application.

Dr. Hamer, the Medical Officer of Health to the London County Council, has been good enough to supply me with certain particulars relating to cases reported between March, 1911, when the disease was

first made notifiable, and March, 1912. It does not appear that any special arrangements have been made for supplying nurses apart from utilising the services of nurses attached to three nursing associations. Apart from this, the supervision of the cases is entrusted to the health visitors of the various constituent authorities, and all cases notified under the Midwives Act are reported to the local medical officers of health. The Council appears to have endeavoured to make arrangements with hospitals to receive both the mother and the infant in very severe cases, but without very much success. However, in the case of 34 notifications received from midwives, hospital treatment was provided, both mother and child being admitted in the case of 18, and the child only in the case of 16.

During the year in question, 673 cases were notified among 112,841 children born, giving a rate per 1,000 births of about 6, which compares with a similar rate in Stoke-on-Trent of 33·4 : a very remarkable difference, which is probably explained by less efficient notification rather than by a lower incidence of the disease.

Apparently the London County Council only make inquiries in cases in which a certified midwife has been concerned, and among 198 such cases, 4 resulted in blindness of both eyes, while in 5 cases the sight of one eye was lost.

As regards the districts other than Stoke-on-Trent in Staffordshire, only in a few instances has the disease been notifiable throughout 1911, and, with one or two exceptions, no specific schemes have yet been adopted for dealing with the cases from a nursing point of view.

As regards the needful machinery for dealing with the disease, and the direction in which failure has to be guarded against, the experience of Stoke-on-Trent affords a valuable lesson. It is of vital importance that the sanitary authority shall receive the earliest information possible of the cases, and provision should be made for supplying nurses as a *sine quâ non* at a moment's notice.

It is not always easy to obtain nurses who have been specially trained for this work, but that is an essential requirement. In every district, therefore, the medical officer of health must know where he can obtain such nurses; and I am afraid we cannot, even in populous areas, depend upon nursing homes to supply the need except by special arrangement and on payment of a subsidy, carrying with it the obligation to supply nurses properly instructed in the work. In the smaller urban and rural areas, however, we shall have to depend to a large extent upon district nurses, or upon the emergency staff of county nursing associations. In my opinion, every effort should be made to deal with the cases by efficient

nursing under medical care at home rather than move the child and mother to an institution. In the homes of the families in which cases occur, however, it is usually not possible to accommodate a nurse during the night, and if both a night and a day nurse should be required, lodgings should be taken in the locality for their accommodation in the event of the institution which supplies the nurses being beyond convenient access.

Having provided the machinery, it is essential that every step shall be taken to ensure that it is promptly brought into operation, and medical men should be informed that they need have no hesitation in applying for nurses as soon as there is the least indication that a case demands skilled, hourly attention beyond what the home can afford.

In conclusion, I venture to suggest that medical officers of health should bring every possible pressure to bear upon their authorities to induce them to provide the needful machinery for dealing with this affection, and thus prevent a large number of cases of permanent blindness. According to the latest information, only 8·3 per cent. of the sanitary districts in England and Wales have made such provision. In Staffordshire, however, 50 per cent. of the authorities, representing 70 per cent. of the population, have done so, and I am hopeful that those authorities who are lagging behind in this respect will soon come into line. As regards the country as a whole, it is amazing to me that authorities have been so lukewarm in providing, at a cost which is so trivial as not to warrant consideration, the means of accomplishing so great a good from a humanitarian point of view, and, incidentally, as has been proved, so considerable a saving in public expenditure.

DR. A. H. BYGOTT (West Suffolk) drew attention to the virulence of some of these cases which became blind in spite of any treatment; much of the trouble was caused by the difficulty in getting medical assistance for this disease of the eye, as a mother was apt to resent being told to get a doctor in simple inflammations which got rapidly well. The Barking Council provided an outpatient hospital to which such cases could be brought, which helped to meet that difficulty. It was absolutely necessary for ophthalmia neonatorum to be treated by persons used to eye technique, as the disease started on the lids, which needed very careful manipulation and cleansing every hour or two hours, and it was very difficult to get the eyes open so as to treat them properly, and practically impossible for an inexperienced person to do so.

In Barking an endeavour was always made in the case of new-born children, to admit both mother and baby into the isolation hospital so that the child might be suckled, as an essential part of the treatment is to secure adequate nutrition for the baby, or if the child was older the mother went to the hospital twice a day to feed it. The scheme answered very well.

Dr. P. Macdonald (York) emphasised the preventability as well as the curability of the disease. He understood that there were grounds for thinking that in Germany there was a great diminution in the incidence of ophthalmia neonatorum. He thought there was ground for an inquiry to see if this was so, and if found to be so, this information might be used for purposes of education in this country.

As to the cure of the disease, the two chief factors were time and energy devoted to the treatment; and cases energetically treated in time were almost invariably cured. There was much need for education, not only of the midwife but of the general practitioner, as to the importance of dealing with the disease at the earliest possible moment, and also of treating it with the necessary energy. He regarded no treatment as satisfactory which meant less than personal treatment by the medical man at least three times a day, or similar treatment by a specially trained and competent nurse, together with treatment of the eye by the parents or other persons in charge between the times of treatment by the medical man or nurse.

Dr. Philip Boobbyer (Nottingham) said that in Nottingham ophthalmia neonatorum was compulsorily notifiable. The cases the Health Department had chiefly to deal with were those occurring in the practice of midwives, and these constituted at least 90 per cent. of all.

The lady inspector of midwives had to see that all cases occurring among the patients of the latter were promptly taken to the eye infirmary for treatment, and was supplied with recommendations to that institution to insure compliance with her instructions to this effect.

Dr. Edmund M. Smith (York) pointed out that the rules of the Central Midwives Board were not sufficient machinery for notification of this disease, as there were still numerous uncertified midwives practising in an irregular manner, whose practice it was very difficult to stop under the terms of the Midwives Act. His first three cases notified under the compulsory notification of ophthalmia neonatorum by medical men were cases under the care of such women.

Dr. C. J. Coleman (Lincoln) said they had recently discussed the question of the notification of ophthalmia neonatorum in Lincoln. They decided that as registered midwives were compelled to notify to the health office all discharges from the eyes of the newly-born under their care in which medical assistance was sent for, the requisite knowledge was forthcoming without further notification. Strong pressure had been brought to bear on the practising midwives to carry out their obligations in this respect. Cases of ophthalmia neonatorum were taken into the County Hospital in Lincoln if necessary.

Enteric Fever Carriers, by CAPTAIN A. H. HAYES, M.R.C.P., D.P.H., R.A.M.C., Specialist Sanitary Officer, Northern Command, York.

THE subject of Enteric Carriers is one which has of late years received much attention, and is of very great interest. I have no original remarks to put before you, but a brief recapitulation of the work which has been done on the subject should prove useful matter for discussion, and may bring valuable suggestions to light.

In the year 1910, a most valuable report to the Local Government Board, by Dr. J. C. D. Ledingham, was published, forming a review of current literature on the subject, and it would be impossible to find a more excellent handbook.

I see no need to quote any instances of outbreaks of enteric fever, the origin of which has been definitely traced to carriers; many have been published, and instances are not infrequently described in current medical literature. As a rule, in such reports the exact means by which infection was conveyed is left to the imagination.

There is little or no doubt that the carrier commonly spreads the disease by means of his hands. There is the greatest possible likelihood of soiling of the fingers in the act of micturition, as far as males are concerned; though it is interesting to note, in this connection, that urinary carriers are more often met with amongst members of the female, than those of the male sex. Similarly, some degree of soiling of the fingers is a very likely accident after the act of defecation, and it is in connection with these possibilities that certain preventive steps must be associated, as far as the individuals themselves are concerned. Incidentally, it is highly probable that, apart altogether from enteric fever, this is a point of great epidemiological importance; I doubt if anyone would be prepared to state that many cases of, for example, infantile diarrhœa, may not be caused in similar fashion. It is customary in the Army, for medical officers, in lectures to soldiers, to lay stress on the great importance of washing the hands after these acts.

It is easy to recognise that in civil life, amongst the lower classes at any rate, this may be an extremely difficult matter, if not an impossibility. Unfortunately, on the one hand, the cheapest of soap costs money, and when there is little enough money for bread, there will certainly be none for soap. On the other hand, it is only amongst the very privileged few, in all classes, that adequate lavatory arrangements allow of the opportunity of systematically practising the habit at any time.

At the same time, the fact must not be lost sight of that here in England, as in India, and other tropical countries, the disease may very easily be spread by means of dust and wind, not to mention flies. I have, myself, lived in a house in England, in a part of the country where high winds are prevalent, where the cottages in the neighbourhood are supplied with dry-earth closets; in dry, dusty weather the garden of this house becomes littered with pieces of fæces-stained paper, which have been blown by the wind a considerable distance and several feet high in the air, from the cottage privies. A carrier only is wanted, under these circumstances, for a very unpleasant little outbreak of enteric fever, individuals acquiring their infection by swallowing water, milk, or other food which has become contaminated by this dust, or even by the very dust itself.

Enteric carriers may be regarded as belonging to one of two classes: A.—*The acute;* B.—*The chronic.*

A.—*Acute carriers* may also be subdivided into:—

1. Persons in the incubation period of an attack. These have acquired their infection with the *B. typhosus* and have been proved to excrete the organisms in enormous numbers, in their urine and fæces, for some fourteen days or so before they have any reason to suspect anything wrong.

2. Persons suffering from the enteric fever attack. These must not be disregarded, for they are not of necessity safe in bed, diagnosed, under treatment, and in the hands of a medical man. We now recognize two classes of case which, unsuspected, may cause spread of the disease: the "atypical" cases, which not infrequently occur in children; and the "ambulatory" cases, where the individual has the disease so slightly that he does not find it necessary to go to bed, but continues to carry out his daily occupation right through the attack, with the possible exception of a day or two indoors. This class of case is, perhaps, the one most dreaded by the medical authorities in the Army, especially when on active service in the field, for a keen young soldier may be very undesirous of "reporting sick" for what seems to him so trivial an ailment as a headache, or a little indigestion, on account of the likelihood of his being detained in hospital. The same would be the case with the bread-winner in civil life under such circumstances, though one cannot say to what extent this may be modified by the working of the Insurance Act.

B.—*Chronic carriers.* When the enteric carrier is spoken of nowadays, it is generally understood that he is of this class, *i.e.*, that he has, at some time or other during the previous forty or fifty years, suffered from an attack of enteric fever, recognized or otherwise, and has harboured the

B. typhosus about his body, constantly or intermittently, ever since. This occurs in from 2 to 4 per cent. of all cases, according to different observers.

There is, however, one other variety of chronic carrier; consisting of a certain number of nurses, and others who have been in attendance upon cases of enteric fever, who have not contracted the disease, yet in whose excreta, on investigation, *B. typhosus* is found in large numbers.

The questions for our consideration are:—

1. How are carriers to be discovered?

2. When discovered, how are they to be dealt with, both as regards their own personal treatment, with a view to getting rid of the infecting organisms from their bodies; and also as regards preventing them from causing further outbreaks of the disease?

With regard to the different classes of carriers, not being gifted with the necessary power of prophecy, we can scarcely hope to discover persons amongst us who are incubating enteric fever. We can deal with known cases of the disease during the attack; we can, at any rate, keep an eye upon contacts to enteric fever cases in houses or institutions, in the hope of discovering atypical or ambulatory cases; and we can similarly keep under our observation nurses and sick-room attendants who may be harbouring the *B. typhosus*.

The discovery of the carrier is, of course, a matter of bacteriological research, and as, in the course of my duties as specialist sanitary officer in the Northern Command, I have from time to time to examine the excreta soldiers convalescent from enteric fever, I thought it might prove interesting if I brought some specimens of media, etc., wherewith to to demonstrate in detail the technique of the procedure by which the *B. typhosus* may be isolated from the excreta. This I have done, and the process is shown upon the table.

There is, as is well known, a multiplicity of media to choose from. The technique as a whole has been described by various writers; and is, in the main, that originally employed by Koch and Drigalski in the anti-typhoid campaign in South-west Germany, in the years 1902–1904 (i). On the media shewn it will be seen that the detection of non-lactose-fermenting organisms, to which the *B. typhosus* belongs, amongst colonies of lactose-fermenters (*B. coli* and its allies) is rendered a moderately simple matter.

I am also shewing a recently described medium (ii) for the further differentiation of the *B. typhosus* amongst the non-lactose-fermenting colonies; one which is well worthy of attention, for the results obtained with it are particularly striking, and it also has the advantage of being unusually simple to prepare. It consists of ordinary agar, to which has

been added enough litmus-solution to give a purple-violet colour, and 1 per cent. lactose, and ·1 per cent. glucose; and is put up sloped in the ordinary way in test-tubes. The suspicious colony is pricked with the point of a platinum needle: this is stroked on the surface of the slope, and also the butt is pierced with the needle. In the case of *B. typhosus*, after 24 hours at 37° C., there is the usual growth on the surface, the colour of the slanted part of the medium remaining unchanged; whereas the butt-end is coloured a bright rose-pink. This appearance is stated to be characteristic in the case of *B. typhosus.*

Examination of Fæces.—Technique.

If the fæces is solid, an emulsion is made with normal saline solution (·85 per cent.) This is allowed to stand for about half-an-hour, to let large masses of organisms sink to the bottom, leaving a more even suspension in the supernatant layers. During this half-hour, the plates of medium are poured, allowed to set, and their surface dried by placing the plates in the incubator, without their covers.

A loopful from the upper layers of the emulsion is placed on the surface of the medium, and is well rubbed all over the surface with a sterile, bent glass rod.

The plate is placed in the incubator, at 37° C., for from 18 to 24 hours, and is then examined for non-lactose-fermenting colonies.

The medium used may be selected from the following:—1. MacConkey's bile-salt-lactose-neutral-red-agar. 2. Drigalski and Conradi's lactose-litmus-nutrose-kristalviolet-agar. 3. Endo's lactose-fuchsin-sodium-sulphite-agar. 4. Malachite-green or China-green media.

Of these four, the first is perhaps the most simple to prepare, and gives very good results; the third appears to be the most popular amongst American workers.

Suspicious colonies are then tested for agglutination with an anti-typhoid serum of high agglutinating power. Further tests with the various sugars may later be carried out.

Thus the decision is arrived at that the individual is a carrier. There fore suitably equipped laboratories, with adequate staff attached, are essential if we are to hope to discover enteric carriers.

Our object being to obtain a register of all carriers, it is obvious that there must be a minimum number of missed cases of enteric fever. To ensure the greatest possible accuracy of diagnosis, the blood of all suspicious cases should be examined by the agglutination-test, which work would be carried out in the laboratories already referred to. During an epidemic,

some effort might be made to impress upon medical practitioners the importance of this, especially with a view to the discovery of atypical or ambulatory cases. It is highly probable that many cases of disease would be brought to light, which are at present passed by, if this practice of blood examination were systematically carried out, without the incurring of additional expense to the patient.

Treatment of the condition.—This has been attempted on various lines by different authorities.

Surgical.—A certain number of carriers, especially amongst women, have suffered from symptoms associated with the gall-bladder. Operations have been performed on this viscus, and the *B. typhosus* has been recovered from it in pure culture. but I am unable to find any recorded case in which the operation has cured the condition.

Lactic acid bacilli have been administered, without permanent success.

Methylene-blue has been given until the fæces were stained blue, but without reducing the number of organisms.

Vaccine treatment also has given disappointing results, as also have *X-rays*, though it as been suggested (iii.) that in gall-bladder cases a vaccine combined with X-rays, and in urinary cases, diuretics, good results might be obtained.

It is possible that Salvarsan (606) might be of use, might even effect a cure; and I hope to discover a carrier suffering from syphilis, with the idea of persuading him to be treated with 606, and thereafter examining his dejecta. This may have been already tried, but I have not been able to find any record of such procedure.

DISPOSAL OF CARRIERS.

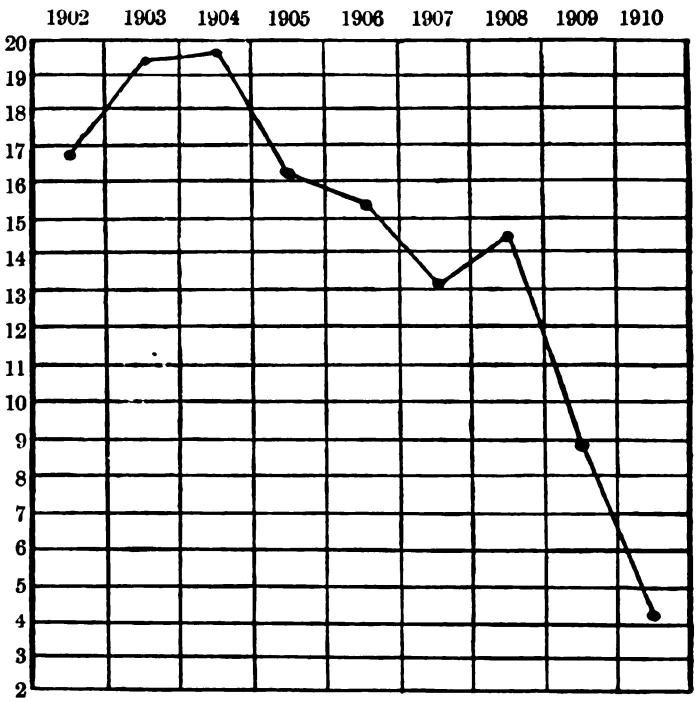
In the Army, the method of dealing with enteric convalescents is as follows:—Examinations of urine and of fæces are made on four successive days at intervals of a month. In the event of three of these monthly examinations proving negative, the individual is released from observation and all restrictions, though a final examination is made after a lapse of a further six months. If he is found to be a carrier, after a period of observation in England not exceeding three months, he is discharged from the Service, unless he elects to remain in hospital for treatment. If discharged, notification is made to the medical officer to the Local Government Board, and to the medical officer of health for the district in which he intends to reside.

Furthermore, in all military hospitals it is customary to have the blood submitted to the agglutination test in all cases of indefinite fever, in which

the temperature does not fall in a few days. Every large military district is supplied with a well-equipped laboratory, and a specially trained medical officer to carry out bacteriological researches of this nature, not only in England, but in all parts of the world where troops are stationed.

As far as possible, men who have had enteric fever are debarred from all duties connected with the preparation or serving of food.

Amongst the British troops in India there has been a remarkable decrease in the number of admissions to hospitals for enteric fever during the last few years. The chart (iv.) shews the admission rate per 1,000



for the disease from the years 1902 to 1910 inclusive. There are several factors which no doubt play an important part in bringing about this reduction. Anti-typhoid inoculation is certainly one, great attention to all sanitary details is another, but probably the most important of all is the segregation of enteric convalescents. In 1906 depots were started in two hill-stations, to which all enteric convalescents are sent as soon as they are fit to travel: here their excreta are periodically examined, and carriers are either detained under treatment or are invalided to England.

If there is any truth in the suggestions made as to the manner in which the carrier spreads the disease, it is clear that, apart from water-borne epidemics, there must be a considerable number of cases occurring in our midst, in which the infection has been conveyed in a direct man-to-man fashion. It is horribly unpleasant to contemplate, but the fact, never-the less, must not be shirked, that practically all the cases of enteric fever outbreaks recorded which have been traced to carriers, have originated in cooks or dairy-attendants. Had these persons been in the habit of washing their hands after the performance of certain natural functions, they would not have conveyed the infection. Fortunately, it has been proved that the most efficacious method of getting rid of enteric bacilli from the hands is by washing with soap and water, and drying on a towel. The importance of this practice might with great advantage be impressed upon children in the schools, special steps being taken to educate the teachers in the matter, as their intelligent co-operation would be of the first importance. At any rate, a habit of this kind is formed much more readily in childhood than in later life. Similarly, the unfortunate carrier himself must, of course, be taught the grave importance of this matter. He must also be made to realize the possibilities of conveying infection by means of his excreta, especially if he reside in a rural district, without a water sewage system.

At what intervals it is necessary to examine the excreta of known carriers I am not prepared to state; we can but hope that, sooner or later, some method of cure will be discovered. Then, with a definite knowledge of existing carriers, with laboratories and staffs to carry out bacteriological work, and with a community trained to an intelligent understanding of the importance of washing the hands, even without a definite cure for the condition, the time may be looked for when the incidence of enteric fever in this country will be to a very great extent diminished.

REFERENCES.

(i.) Journal of the Royal Army Medical Corps, February, 1906, "Report on the Methods employed in the Campaign against Typhoid Fever in Germany," by Capt. E. D. W. Greig, I.M.S.

(ii.) Journal of Medical Research, September, 1911, "A New Double Sugar-Tube Medium," by F. F. Russell, M.D.

(iii.) Journal of the Royal Army Medical Corps, April, 1910, "Treatment of Typhoid Carriers," by Major S. L. Cummins, Capt. H. B. Fawcus, and Capt. J. C. Kennedy, R.A.M.C.

(iv.) Reports on the Health of the Army for the years 1902 to 1910.

Deputy Surgeon-General W. W. Pryn (Royal Naval Hospital, Chatham) said they did not get a large amount of enteric fever in the Navy and so had not many carriers, but somewhat elaborate precautions, similar to those enumerated by Captain Hayes, were taken to prevent the spread of enteric fever by convalescents. Difficulty arose as to the disposal of a carrier. He was in favour of invaliding the patient after a period of three or four months had elapsed, discharging him and notifying the medical officer of health of the district to which he goes of the facts of the case. That was a perfect safeguard as far as the service was concerned, but he should like to hear the views of medical officers of health on the practice.

Mr. F. E. Fremantle (Herts C.C.) said it did not seem quite clear how Captain Hayes would suggest that infantile diarrhœa was spread through defective toilet of the perineum. But the importance of the subject was obvious, especially on considering that certain classes of the population, those most requiring the efforts of sanitary administration, do not ever use toilet paper, and must inevitably soil their hands and clothes. The use of toilet paper and of hand-washing must in general be taught and insisted on in the schools. But to establish a general habit of hand-washing after micturition as well as defecation requires the provision of washing accommodation in every lavatory. To urge such provision may be our duty, as a result of this suggestive paper that we have just heard; but it would add to the cost of building, and would invite criticism and ridicule, for which, if necessary, we must first be prepared. The suggestion requires careful consideration.

As to the segregation of convalescents, it may be argued that the community need take no note of whether a carrier of infection is healthy or ill; in either case it needs to protect itself against the infection. But for the present there are no effective legal powers to deal with the apparently healthy, however infectious; the method to be adopted was that of visiting and persuasion. Possibly, under the National Insurance Act such visitation and persuasion, both by medical men and health-visitors, as well as by sanitary inspectors and medical officers of health, may be much facilitated.

The suggestion as to spread of infection through the hands of milkers and dairy-workers after micturition and defecation gives us an additional weapon in our efforts to secure cleanliness in the production and distribution of milk.

He would express the respect and cordial thanks of the civilian sanitary profession for the admirable combination of research-work and practical administration by the R.A.M.C., so well represented by the paper under discussion.

CONGRESS AT YORK.

CONFERENCE IV.—VETERINARY INSPECTORS.

Presidential Address, by PROFESSOR J. R. U. DEWAR, F.R.C.V.S., President of the Conference.

IN opening the veterinary section of a sanitary congress, one is met at the outset by the question, how and by what means can the veterinary profession best assist in the promotion of better hygienic and sanitary conditions in the world around us? Amongst ourselves we discuss and endeavour to improve the sanitary and hygienic conditions affecting meat and milk, their production and distribution, the sanitation of byres and stables, the prevention and eradication of animal diseases, more especially those that are communicable to man. But we must confess to ourselves that the improvement in the conditions of animal life, and the prevention of animal diseases, while exceedingly desirable and beneficent in themselves, especially from an economic point of view, are merely the means to an end. It is in the relation which these questions bear to the improvement of the health of the community and in the preservation of human life that they mainly derive their importance.

No doubt considerable improvement has taken place since the advent of the present century. We read every other day in the pages of the daily press how sanitarians are congratulating themselves on the diminution of the death-rate, more particularly with regard to tuberculosis. But we know that only a beginning has been made; that a great deal still requires to be done before that terrible scourge can be confined within any reasonable sort of limit, far less completely eradicated.

There is all the more need for sanitarians to be up and doing, when they consider the last census returns in our country, that notwithstanding the declining death-rate the normal increase of the population has practically ceased. This is in great part due to emigration, but we know that the birth-rate is diminishing at a greater ratio than the death-rate. That this is not confined to the British Isles does not make it any the less serious, rather the reverse.

We see it reported that the Premier of the Australian Commonwealth is about to propose to the Federal Governments that a maternity bonus should be granted to mothers. They might consider whether it would not be more advisable to offer a premium for large families. I do not mean

large in the old understanding of the family but in the new, and that the premium should increase at each birth by the square of the number of children. In all seriousness is it not worth considering? But we cannot afford the time to discuss sanitation in the abstract to-day.

But, if I may be allowed, I should like to make a few remarks regarding the duty of the Government to intervene and try to do something to restrict the spread and dissemination of tuberculosis amongst animals. There is no use in quoting statistics. We all acknowledge the prevalence of tuberculosis amongst our bovine population; and nearly as well known, if not quite so generally admitted, is the risk that arises to the human subject from using the meat and milk of tuberculous animals as articles of food. Although the risks are now pretty generally acknowledged to be less than were at one time believed, few, if any, will dispute their existence, and in the case of children and delicate or weakly individuals using raw milk the risk is a terribly real one.

For more than twenty years now (since August 12th, 1889) the supervision of the health of the livestock of the farm has been committed to the care of a special Government Department, and although that Department has looked quietly on while tuberculosis was killing, not only its thousands, but its tens of thousands annually; looked on as if completely oblivious of the facts without so much as moving a finger to prevent the spread of the disease, that is no reason why the Department should not begin to move at last, should not now do something by way of honest endeavour, for the protection and improvement of the health of the livestock of the country. Perhaps our profession is not altogether guiltless in the matter in that it has not done more to educate the public regarding the terribly serious nature and the extent of the disease. It ought to be more insistent in the matter. We ought to insist, in season and out of season, that something should be done, that some attempt should be made to arrest the progress of this terrible scourge.

No Government can proceed far in advance of public opinion. But public opinion is being educated, and the demand that something should be done is becoming more and more clamant. If there is not very much demand for Government interference as far as breeding stock is concerned, there is no doubt but it is otherwise as affects dairy stock. And it is with the tuberculous dairy stock, with the cow yielding milk containing tubercle bacilli that we expect the Government to interfere first. The demand for that is now so general that it surely cannot be long resisted.

In the section of the United Kingdom to which I belong, the subject

is certainly being kept before the public. On the 14th June the Scottish Chamber of Agriculture and Associated Societies held a conference at Perth at which a resolution was unanimously passed, demanding Government compensation for the tuberculous dairy cow, *i.e.*, that instead of merely ordering the cow out of the byre, she should be condemned to be slaughtered, and compensation paid for her.

Then the National Federation of Meat Traders' Associations held their annual conference in Edinburgh in the third week of June, and discussed tuberculosis from their point of view. They rejected a motion to demand compensation from the Government for carcases condemned on account of tuberculosis in favour of an amendment demanding a full warranty from the seller. It was argued that by throwing the responsibility back on the farmer he was more likely to strive to eliminate the disease from his herd, to endeavour to keep nothing but healthy animals to breed from.

And in the "Scotsman" newspaper of 21st June, a communicated article appeared, filling a column, stated to be by a veterinary expert, headed "Tuberculosis and Milk." It also recommended Government interference and payment of partial compensation. It is evident, therefore, that the subject is not being allowed to slumber as far as Scotland is concerned.

We all remember, at least if we do not we must have very short memories, that the Board of Agriculture attempted to deal with the disease some three years ago. An Order was promulgated in May, 1909. Its operation was subsequently postponed, and before the year was out it was withdrawn altogether. It only proposed to deal with the tuberculous dairy cow. Then why was it withdrawn? I presume, to use a rather expressive Americanism, because the Board found "it had bitten off more than it could chew." The Board unfortunately, proposed to put the onus of paying compensation for condemned cows on the local authorities.

This raised quite a storm of criticism. Local authorities everywhere were up in arms against it. They felt that the burden of compensation would be in many cases so unfair that they could not but protest. The unpopularity of the Order was due to the reason given by the Board itself in the Foot and Mouth Disease Order of 1895:

> Sec. 25 (1).—"A local authority may, if they think fit, withhold, either wholly or partially, compensation in respect of an animal slaughtered by their order under this Order, where the animal was, in their opinion, diseased at the time it was brought into their district."

Now if there was any reason whatsoever for a section like this in connection with foot and mouth disease, with its short incubative period,

there is ten times more reason for it in relation to tuberculosis. It is practically admitted that one-third of the cows brought into any district are already tuberculous. Surely no one will affirm that compensation should be paid by a local authority for a tuberculous cow the day after it is brought into the district of that authority. Then how soon after; or at what stage of the disease should an owner have a legal claim to compensation? There is no doubt this question will have to be faced, even should the Government decide to pay compensation from State funds. But it is a much more difficult question if local authorities are asked to pay compensation off the rates. The suspicion may easily arise that one local authority is permitting its tuberculous cows to be palmed off on another. It may readily be suspected that a rural district is getting rid of its piners by passing them on to an urban one, although this would be very difficult of proof. There is no doubt but compensation should be paid by the State, and then most of those questions which give rise to strifes and jealousies, and even legal disputes, would never arise.

Apart altogether from a public health point of view, looking at it only as a veterinary question and concerning agricultural economics, it will be found that the tuberculous dairy cow is the most vulnerable point at which to begin our attack against this insidious and destructive disease.

There is no doubt that tuberculosis should have been tackled long ago, and that it would have been but for its almost ubiquitous nature. It could not be dealt with like other contagious diseases of animals, simply because it was too common. To have dealt with it would not only have upset the dairy industry, but the live-stock industry, and would have caused a shock to many collateral industries in interfering seriously with the country's food supply. But by dealing with the tuberculous dairy cow to begin with, this shock will be modified to a large extent. In attacking the tuberculous dairy cow we will get the support of the Local Government Board, and of all those, a very large body, who are interested in public health questions, and a fair start should be got in dealing with the big subject of bovine tuberculosis.

The fact of tuberculosis being classed as a notifiable disease, if only in the case of tuberculosis of the udder and of obvious piners, will have a very deterrent effect. No stockowner will be anxious to have his name in the *Gazette* as the possessor of a tuberculous animal, and to a breeder of pedigree stock to have his herd practically advertised as tuberculous will be a veritable anathema. The point is, however we may account for it, that the breeders of pure bred stock have, with a few laudable exceptions, done very little to get rid of the disease. They repel with indignation

the suggestion that any animal of theirs should be affected with tuberculosis; and should they attempt anything in the way of eradicating it from their herds, it is done most unobtrusively and without any ostentation. There is no doubt, therefore, that were the disease notifiable, and centres of it published in the *Gazette*, it would stimulate breeders to more vigorous efforts to get rid of the disease.

As long as we deal only with the tuberculous udder and the conspicuous piner we are only dealing with the nearly finished article; we are only picking up the products of the disease. Before these can be prevented we must attack the disease at its source, at the breeding farms where, as a rule, it is thought too lightly of. And it is only when a particularly virulent type of the disease appears, when the losses at the breeding farm become serious, that the breeder begins to realise that he has a virulent contagious disease in his herd, and becomes anxious to get rid of it (a thing that is often done by clearing out the herd) and not always to the shambles. No doubt, therefore, the scheduling of the disease would prove a great stimulus to the efforts to repress if not to eradicate it.

Restrictions such as are here indicated may be all that could be put forward at present, but before the disease is got rid of, or even confined within more reasonable limits, sterner measures will be required. Our Board of Agriculture is experimenting with a scheme for the registration of sound stallions. It seems to me that after a few years the Board may gradually restrict the breeding from unsound horses, until ultimately no one would be allowed to present a stallion for breeding purposes that had not a Government certificate of soundness.

Now, might it not be possible after a time, a considerable time it may be, for the Board to pass an Order that all bovine animals (not males only) sold for breeding purposes should be liable to be returned to the seller, on whom it should be obligatory to return the purchase money if the animal is offered back within twenty-eight days, along with a Government certificate that it is affected with tuberculosis.

One thing is certain, the disease cannot be left alone indefinitely; it must be attacked sometime and somehow. It cannot be attacked indiscriminately by wholesale slaughter and compensation, and discussion regarding the possible methods of dealing with it should be gratefully welcomed.

The Eradication of the Tuberculous Milch Cow, by PERCY J. SIMPSON, F.R.C.V.S.

THERE can be no two opinions as to the desirability of the banishment of the tuberculous milch cows from our midst, both from the medical and veterinary aspect. A doubt has been cast in recent years on the transmissibility of bovine tuberculosis to the human subject. This theory is now generally disbelieved.

Any suggestions brought forward, must therefore be founded on the assumption that bovine tuberculosis is readily communicable to man, and may be conveyed in the milk of tuberculous cows.

When draughting any schemes for freeing our milch cows from tuberculosis and preventing its reappearance, several facts must be borne in mind.

Any sudden or very drastic action might do a great deal of harm, as an example:—if every tuberculous milch-cow, discovered by means of the tuberculin test, applied all over these Isles, were instantly slaughtered, or the milk from these animals stopped, the children of the poor would be practically starving, owing to the high price milk would obtain, due to shortage of supply.

With unlimited funds for instituting a complete and thorough testing with tuberculin of all milch cows, the slaughter of diseased animals, the compensating of owners, and the thorough disinfection of cow byres; the task of eliminating tuberculous cows, although heavy, might eventually be carried through.

Sufficient money for this is never likely to be forthcoming; but the subject before us is one of such national importance that as much money ought to be provided by the State for the protection of infants who will eventually be the workers of the nation, as is now expended in providing for the maintenance of those past the working age.

The method of applying what funds might be available, and the fairest way of apportioning them, are matters open to discussion; the two most expensive items being the payment of inspectors, and compensation.

Inspection of herds, meat and other foods, is now rightly considered a matter of such importance that local authorities should appoint whole-time inspectors for this duty. The present lax and unequal methods of inspection should be gone into, and some local authorities should be compelled to institute inspection of dairy herds within their areas.

Again, there are men appointed to the position of inspector, who are totally unfitted for the post, and it should be a *sine quâ non* that no man

should be appointed unless holding a recognized diploma or certificate. The men best qualified to inspect dairy herds and cow-sheds are veterinary surgeons, and in cases where the cause of an outbreak of disease among humans is due, or suspected to be due, to contaminated milk, he and the medical officer of health should act together to decide the question.

Qualified men will probably not take these posts at the same remuneration as the ordinary sanitary inspector who has cow-shed inspection added to his other duties, which no doubt he is fully qualified to deal with, but in the end the extra outlay would be justified.

It is not necessary to harass the cow-keeper; but haphazard, occasional inspections will never produce the desired result. Inspection should be carried out once every month.

Before discussing the amount an owner should be paid as compensation for an animal that is compulsorily slaughtered, it must be decided how tuberculous cows are to be dealt with. Are all cows that react to the tuberculin test to be immediately seized and slaughtered? This procedure would be almost fatal to the milk industry, and milk instead of being the staple food of infants would become a luxury that only the rich could indulge in.

In cases where a milch cow reacts to tuberculin, but is in good condition, has no clinical defect of the udder, and whose milk is proved to be tubercle free, should be allowed to remain as a milch cow until dry; but should be subjected to periodic veterinary inspection, the milk tested at intervals, and the animal kept isolated from the healthy ones or placed in company with others in the same category.

When the animal has ceased to give milk it should be valued as a tuberculous cow, slaughtered, and the carcase carefully inspected.

If any portions are passed as fit for consumption they should be sold, and that amount credited to the owner, and half of the difference in agreed value prior to slaughter paid as compensation.

All interested in this subject will, I think, agree that in all cases where tuberculosis of the udder is present, or where tubercle bacilli are found in the milk, the sale of such milk should be immediately stopped and the animal slaughtered. Compensation for such cases to be paid.

Under the Dairies and Milk Shops Order an inspector is able to stop the sale and use of tubercle infected milk, but this does not go far enough, as the cow may be sold in the open market, and there is often difficulty in tracing it.

These are of course severe measures to adopt, but if any real benefit is to be obtained, the subject must be firmly and thoroughly handled; there

is no necessity to largely compensate owners of tuberculosis cows if they are warned and given a reasonable time to "put their house in order."

The tuberculin test is now accepted as reliable, and the cost of having the test applied is comparatively small when its benefits are taken into account. The price paid for cows that stand the tuberculin test is higher than that paid for animals bought in open market; and if the system of buying only cows that have passed or would pass the test was generally adopted, the cow-keeper would be justified for a time in raising the price of milk.

Before the adoption of such severe and costly measures as suggested above, a system of co-operation between the Government and cow-keepers might be given a trial.

If a cow-keeper can prove that his cattle have been regularly inspected and tested by a qualified veterinary surgeon, and that his herd is tubercle free, he should receive a premium at the rate of so much per head per annum from the State, and should also have a certificate issued by the Government, which would be held to be a hall-mark for the purity of his milk. This system would be open to abuse, but what rules and regulations are not? The public would soon learn of this guarantee and the man who did not take advantage of it would soon find his trade diminish, and would have to fall into line with the others, or lose his trade.

That it is possible to start and maintain a tubercle-free herd, and at the same time make it remunerative, has been proved. I know of such cases where the owners are not moneyed gentry with large estates, but hard-working, hard-headed farmers. In every case they have a larger demand for milk than they are able to supply.

Many farmers and cow-keepers have much to learn with regard to bovine hygiene. It is yet very difficult to convince some of them that ventilation, drainage, general cleanliness, etc., are not to be looked at from the point of satisfying the inspector, but that they are matters which, if put properly into practice, are of great benefit to their herds, and incidentally to themselves.

So, too, the small breeder has in a vast number of cases yet to learn that the offspring from unhealthy parents costs just as much to rear, and often more, than those from healthy ones brought up in suitable surroundings.

Much is being done by the different cattle breeders and agricultural societies in trying to raise the standard of our herds, and they could be of great assistance in helping to solve the problem of the tuberculous cow, if they concentrated their energies in this direction by constantly bringing the matter before their members.

Mr. D. GEORGE COLLINS (City of London) said that for years this problem had occupied the attention of medicine, and the trade science. Let them try to urge to a conclusion their beliefs, and send a strong resolution to the Board of Agriculture and Local Government Board to call a conference of breeders, dealers, insurance companies, and local authorities to initiate a scheme for legislation. A milch cow, if found yielding infected milk, should be immediately slaughtered. Some of the meat might be found free from disease, and the difference between the results of sale and value could be made up by a joint contribution from the State and insurance companies.

SIR SHIRLEY MURPHY (London) said he thought that the first question which needed to be considered was whether it was practicable for the owners of cattle to take steps to reduce the prevalence of, or eliminate tuberculosis from their stock. He believed the answer to this would be in the affirmative. The second question was how the owners of cattle could be induced to take the steps which were deemed necessary for this purpose, and he thought this could only be done by preventing the products of tuberculous cattle realising the same value as those of other cattle. This could be done by efficient administration. A wholesale system of compensation would remove the responsibility, which the owner should feel, that he must adopt the recognised precautions if he desired to escape loss. No doubt many could ill afford to bear the whole loss, but he thought this could best be met by a system of insurance, which would be managed by stock-owners whose interest would be to see that those who insured their cattle did not by negligence bring loss to the fund. He would rather see public money used for encouraging the institution of a system of insurance than given in the ordinary way of compensation.

ALDERMAN BATY (Newcastle-on-Tyne) urged that all cows that supplied milk to the public should be tested by qualified veterinary surgeons, and all reactors should be branded, so that wherever they were moved to they would be known as reactors. The Government should compensate the farmer, as had been done in stamping out foot-and-mouth and other diseases that were not communicable to human beings.

MR. G. WILLIAM LACEY (Oswestry) wished to mention in reference to the inspection of dairy cows that some even small authorities were taking this matter up. His own council had recently instituted a half-yearly inspection by their veterinary surgeon of all milch cows in the borough, and also of those in the surrounding district supplying milk to the borough. There being no legal power to do this outside the borough a conference of the cow-keepers was called, who all agreed to accept the inspection of the veterinary surgeon. The result of the first inspection showed that out of just over 300 cows only two definite cases of tuberculosis were discovered, while three other cases were held to be suspicious

and were being further examined and inoculation tests applied to them. When the owners of those tuberculous cows were notified, the cows were sold from their herds and left the district to our advantage, but to some one's disadvantage. Undoubtedly, steps to remedy this state of affairs ought to be taken. With regard to one speaker's suggestion to brand tuberculous cows, that might be advantageous, but an embargo would at once be put on the sale of such cows, and loss to the owner would ensue. That raised the important and difficult problem of compensation, and it would seem that in the interests of public health some compensation should be given for the compulsory slaughtering of tuberculous animals, and that could better be borne by the State than by the local authorities or owners of the cattle.

MR. HUGH BEGG (Lanarkshire C.C.) said that Mr. Simpson recommended the inspection of all dairy herds once a month. That might be possible and advisable in cities, but was unnecessary and impracticable in country areas, where a great many of the herds were young and the distances between them great. In Lanarkshire they inspected every herd once a year, and many of the older herds twice or three times.

He thought that before they urged those in authority to extend to them additional powers to deal with the tuberculous milch cow, it would be well if those authorities who at present took no advantage of the powers they already possessed were forced to do in their own areas the work that was being done so faithfully and at much expense in many cities and a few counties.

If they would come into line there would be less difficulty in ensuring the proper disposal of cows condemned for tubercular disease of the udder, and they could then with good reason urge that compensation should be paid for the condemned cow.

So long as their power was limited to dealing with the tubercular milch cow, there would be a perpetual crop of such animals needing the sickle each year, and, even after years had elapsed, there would be but little improvement so far as their herds were concerned.

Veterinary surgeons should press their respective local authorities to undertake conscientiously the work that lay to their hand, and when this was done they might reasonably apply for the money and the power necessary for the complete eradication of bovine tuberculosis, a task which the veterinary profession was capable of carrying out successfully.

MR. W. H. BROOKE (Birmingham) said that Prof. Günther had remarked that tuberculosis, of all diseases, brought the human practitioner and veterinary surgeon together. In the consideration of tuberculosis, which was so prevalent in herds, they had so much in common that a combined action of the two professions, which both must recognise as necessary, was both essential to a comprehensive dealing with the disease itself, and to forcing home upon

the Government the absolute necessity of early and effective legislation. Practically all that Government had done had been the ineffective dealing with the tuberculous mammary gland when they knew that affected animals were passing bacilli in the milk in the absence of lesions eitherin the mammary gland or its lymphatics. The general medical practitioner did not appreciate the importance of milk infection as a source of infantile tuberculosis, and had evidently not realised that in about 13 per cent. of investigated cases bacilli of the bovine type had been found; for even young people, considered to be in the early stages of tuberculosis, were recommended to take cow's milk in large quantities as a diet, and no precaution was taken either to provide for its coming from a tubercle-free source or for sterilisation. Surely that was wrong.

Many country cow-houses were a disgrace to modern sanitation, and much good would be done in preventing milk infection if necessary grooming and general cleanliness were attended to; for knowing, as they did, that close upon 60 per cent. of animals affected with tuberculosis had bowel lesions, it was easy to see how readily milk became infected when the commonly filthy condition of flanks, quarters, and tails was taken into consideration.

Pending legislation, the Birmingham authorities, on the initiative of Dr. Robertson, medical officer of health, and Mr. J. Malcolm, F.R.C.V.S., city veterinary surgeon, were applying the tuberculin test free of charge to dairies supplying milk for the city's consumption, on condition that the diseased should be separated from healthy animals, and milk from tuberculous animals not sent out for human consumption.

Compensation to one-fourth, with a maximum valuation of £16, for animals which it was considered advisable to destroy, the owner to have the benefit of the discriminate disposal of carcase, was generally accepted.

Foot and Mouth Disease, by D. GEORGE COLLINS, Chairman, City of London Cattle Markets Committee.

THIS dread cattle-scourge has been known from time immemorial. During the last 50 years official action has been successfully combating it and gradually reducing its operations. Judging by experience and the onward course of research, it is highly probable that ere long it will be as effectually dealt with as many other diseases have been.

Its origin and means of dissemination are uncertain. Animals subjected to close contact with the disease have been known not to develop it. Animals in no suspected way in contact with it have with incredible facility exhibited the disease in its most virulent form.

The Report of the Departmental Commission appointed to inquire into Foot and Mouth Disease states, "There is but little exact knowledge, even among the greatest veterinary experts, as to the nature, origin, and means of transmission of this disease."

In the early seventies markets were opened in London, Belfast, Cardiff, Dundee, Plymouth, Falmouth, Granton, Grimsby, Glasgow, Harwich, Hull, Leith, Liverpool, Newcastle, Portsmouth, Southampton, and Barrow under the Contagious Diseases of Animals Act, 1869, for the reception, sale, and slaughter of animals from countries where foot and mouth disease was known or suspected to exist. Prior to this practically free entry had been given to all animals. By Parliament thus scheduling the complaint as a disease, and limiting the ports of entry, the first step was taken to supervise and check the importation of known or suspected disease, to control the trade, and stamp out the scourge.

In 1892 compulsory slaughter was first resorted to by the Board of Agriculture as a means of stamping out the disease.

In 1893 a new Act was passed restricting the uses of these markets to the importation of live animals from only those countries which were declared free of foot and mouth disease, thus precisely reversing the policy for which the markets were specially built and equipped.

In 1900, these markets were closed against South American animals, owing to an outbreak in nine English counties, involving twenty-one cases.

In 1903, the markets were re-opened to South America for three months, and on official proof that that country was still infected, the permission order was withdrawn, and since that date all British ports have been closed to South American stock.

Owing to the trade being restricted to countries free of disease in 1900, the number of cities engaged in the trade had been reduced to nine: Bristol, Cardiff, Glasgow, Hull, Liverpool, London, Manchester, Newcastle, and Southampton, and this year only five remain: Birkenhead, Bristol (Avonmouth), London (Deptford), Manchester, and Glasgow.

The following table, published by the Board of Agriculture and Fisheries, is of vital interest in the consideration of this subject.

TABLE XI.—FOOT-AND-MOUTH DISEASE.

Number of Counties in Great Britain in which the disease existed, number of outbreaks reported, and number of animals returned as attacked, 1877–1910. No outbreaks in the years 1887–91, 1895–9, 1903–7, and 1909.

Years.	Counties.	Outbreaks.	Animals attacked.			
			Cattle.	Sheep.	Swine.	Other animals.
1877	55	858	5,640	7,405	2,099	...
1878	45	235	912	8,609	245	...
1879	29	137	261	15,681	5	...
1880	38	1,461	20,918	9,572	1,886	2
1881	49	4,833	59,484	117,152	6,330	80
1882	49	1,970	23,973	11,412	2,564	1
1883	75	18,732	219,289	217,492	24,332	32
1884	55	949	12,186	14,174	1,860	1
1885	10	30	354	34	30	...
1886	1	1	10	...	...	...
1892	15	95	1,248	3,412	107	...
1893	2	2	30	...	...	...
1894	3	3	7	261	...	...
1900	9	21	214	50	2	...
1901	3	12	43	626	...	...
1902	1	1	2	118	...	...
1908	1	3	112	...	...	...
1910	1*	2	13	...	2	...

* In York, West Riding, 66 cattle, 203 sheep, and 3 swine were slaughtered as diseased or exposed to infection

In 1911 there were 19 outbreaks, and in 1912 at the date of the writing of this paper 43 cases. Ireland has been free from 1883 to 1912.

For the 35 years under review Great Britain has been free of the disease for 16 years.

The recurrence of epidemic during the last 2½ years, totalling 56 cases, is disconcerting.

No evidence is yet to hand as to the cause of the outbreak in Ireland this year. The dissemination of the disease throughout England, Wales, and Ireland (Scotland happily being free), according to a statement made by the vice-president of the Board of Agriculture for Ireland in the

House of Commons appears to be mainly due to gross carelessness and a wilful suppression of facts from the authorities. . . . . "There had been rumours in the House, and there seemed to be an uneasy feeling that this disease had existed in Ireland without publicity being given to the fact. It was quite true that this disease must have existed before the department discovered it on Sunday; but the strictest investigation was now in progress. On the Saturday on which the animals were shipped to Liverpool a quack veterinary doctor was brought on to the farm at Swords by its owner. He did not mean a qualified veterinary surgeon, but a man of the type known as a "knowledgeable man." This man admitted that he had been on Saturday week, and that he had treated six or seven cattle for what he called "timber tongue," but he declared he had not been on the holding since the previous February. Thus there was the fact that this man was brought in to treat sick animals on the very day they were shipped. That fact was concealed from the department and the local veterinary authorities, and nobody in the neighbourhood was aware of the disease being on that farm. The moment the department got information they took action. They lost not a moment in tracking the matter down, and they had, at all events, succeeded in confining the disease to the area of Swords, where up to 12 oclock that day no fresh outbreak had been reported." Subsequent events proved how widely the disease had been disseminated and with what disastrous results.

Primarily the acts of the Board in keeping closed the live markets against infected countries is the protection of the interests of the British farmer and breeder. It is a subject claiming in its discussion a minority who urge, not without logic, that considering the many known ways in which the disease may be imported, by hay, fodder, grain, hides, packing, eggs, clothes, crates, wrappers, whether any serious additional risk is entailed by the importation of cattle themselves, shipped when healthy, passed by qualified veterinary surgeons, subject to a period of quarantine during voyage, and again subject to vigilant inspection when landed.

Speaking officially as Chairman of the Committee controlling Deptford Foreign Cattle Market, there have been hundreds of cases of foot-and-mouth disease landed there during the last forty years. These have all been effectively dealt with, and there has never been any statement that the disease had been disseminated from this or any other foreign animals wharf. This is a striking testimony to the efficiency of the work of veterinary officers, and to the possibility and even the certainty of an

absolute control of the disease when it is found in the animal itself. It may be taken as a happy augury for the possibility of the re-opening of the trade in healthy animals, even if imported from countries where the disease may be suspected of existence.

It is impossible to prevent the entrance of disease through channels of commerce by articles that cannot be examined and tested from their very nature and origin, but efficient inspection of the animals themselves before and after importation has been undeniably demonstrated.

The stoppage of importation from "known or suspected" countries has had two deplorable results. Firstly, many distinct trades dealing with the by-products (one expert estimates them at as many as thirty) have been seriously prejudiced. Secondly, when it is remembered that the edible offal of one bullock affords cheap food for no less than forty persons, and that of a sheep for eight persons, it can be seen how far-reaching is the effect of the existing order. True, offal is imported, but it is not so satisfactory to inspect frozen offal boxed in bulk, when only sample boxes per shipload can be examined, while at a foreign animals wharf every organ can be carefully inspected at the time of slaughter, and lesions more easily detected.

These facts call for an answer. By keeping out cattle are we closing one door that can be effectively guarded, and leaving wide open many other doors that can in no way be guarded?

The sensational statements in daily newspapers do not help a calm consideration of this subject. One London daily, for instance, stated that foot and mouth is the most deadly disease to which British stock is liable. This is not so. It rarely kills, half per cent. only of infected cattle succumbing, but is chiefly dreaded because of its extreme infection and the deterioration it causes to herds by loss of condition and flesh and diminution of the milking power of dairy herds. The restrictions rather than the loss inflicted by the disease itself constitutes the chief damage to the farming industry. According to *Farm and Home* "the trade in store stock will be much more seriously affected, and should, unfortunately, the restrictions have to be enforced for any considerable time, both buyers and sellers will be checkmated for the remainder of the season, Ireland being the main source of our supplies of store stock for the graziers." Owing to the scarcity of store stock in Great Britain, an opportunity now occurs to re-open all British ports for the introduction of Canadian store cattle, in which country the officials state that no case of foot and mouth or other contagious disease has been found, thus giving the English farmer a further opportunity of competing against foreign importation.

It is almost impossible to calculate the money damage incurred by our breeders owing to this outbreak, as all countries have prohibited for six months from the date of outbreak the importation of British pedigree stock.

I have abstained from repeating particulars of the symptoms of this disease and the details of outbreaks in this and other countries, striving rather to treat the subject in its relation to our farmers, our traders and our countrymen from the point of view of employment and food. I refer all to the report on Foot and Mouth Disease published by the Board of Agriculture and Fisheries in June last, particularly calling their close attention to "the means by which the virus of disease may be imported." I congratulate that Board upon its efforts to combat the disease and to obtain additional information.

One result of the existing conditions is that the chilled and frozen meat importation has grown to closely on 84 per cent. of meat consumption. British farmers are met with that competition, and although it may be urged that never was the meat food of the people so cheap, there are those who urge that fresh killed meat has its advantages as an article of food, while the employment given in the breeding rearing, selling and slaughtering of the home animal, together with the employment of those feeding the same, and of those employed in the various trades interested in the offal, hides, etc., all form subjects closely interwoven in the consideration of the subject.

I look forward to the time when it will be deemed politic in the greatest interest of the greatest number to again allow the best cattle from Argentina to come to our shores.

Already science is whispering, even asserting, that absolute immunity against the disease can be obtained by inoculation, and that Parliament has appointed a commission with ample funds to do experimental work in one of the most fruitful countries of this disease, India, is a sure sign that our past efforts are to be crowned with a lasting success for the future.

Milk in Relation to Disease, by J. Basil Buxton, M.R.C.V.S., D.V.H., Professor of Hygiene, Royal (Dick) Veterinary College, Edinburgh (member).

TUBERCULOSIS.

ALTHOUGH direct infection of the milk with tubercle bacilli from a tuberculous udder is supposed to account most commonly for the presence of these organisms in cow's milk, yet one must not lose sight of the fact that there are other fruitful sources of contamination. The dust of the byre may, and often does, carry tubercle bacilli, which were derived from the sputum of a cow suffering from pulmonary tuberculosis, or from the sputum of a consumptive milker or attendant. Dried fæcal matter containing virulent organisms may infect the milk, for it is well known that, while in many cases of slight tuberculous lesions small quantities of organisms are found in the fæces, yet where the animals are clinically tuberculous, large numbers of living and virulent tubercle bacilli may be present. Furthermore, the saliva of tuberculous cows may contain large quantities of virulent organisms, and hence when they lick their flanks the bacilli are deposited there, and so gain access to the milk during milking. The milk of tuberculous cows invariably contains large numbers of bacilli, but the presence of the bacilli in the milk is not always in proportion to the extent of the disease in the animal, especially when diagnosed clinically.

It was originally believed, and is still maintained by some, that the milk of tuberculous cows is infected only when the udder is affected. It has been shown, however, by various investigators that tubercle bacilli may be found in the milk of cows suffering from generalised tuberculosis without affection of the udder, so far as careful examination during life and post-mortem could show. Again Rabinowitsch and Kempner showed that when the milk of fifteen cows which had reacted to tuberculin, but showed no clinical signs of tuberculosis, was inoculated into guinea pigs, 75 per cent. of the animals yielded milk containing virulent tubercle bacilli. Further, Dr. Mohler, of the Bureau of Animal Industry, Washington, carried out a series of experiments in this connection. He inoculated and fed guinea pigs upon the centrifugalised sediment of milk and cream from a number of cows that had reacted to tuberculin, but showed no signs of udder disease clinically. In all, 56 cows were used, and of these 12 were found to yield milk containing virulent tubercle bacilli. As a result of his experiment Mohler arrived at several important conclusions, namely, that tubercle bacilli may be demonstrated in the milk of tuberculous cows, whose udders

show no sign of the disease either macroscopically or microscopically, and in sufficient numbers and of sufficient virulence to produce infection both by ingestion and inoculation. Also that the udders of tuberculous cows may become infected at any moment, while the presence of the tubercle bacilli in the milk of tuberculous cows is not constant, but varies from day to day. Similar experiments demonstrating the infectivity of the milk of cows which have reacted to tuberculin, but whose udders were clinically unaffected, have been made by various other authorities, while on the other hand, Ostertag and Young in various experiments which they carried out, obtained negative results when such milk was fed to and inoculated into guinea pigs. There seems, therefore, to be some doubt regarding the presence of tubercle bacilli in the milk under such conditions. The discrepancy is, however, not to be wondered at, for it is highly probable that the bacilli only make their appearance in the milk under these circumstances, when they are present in the blood or lymph streams as the result possibly of the breaking down of some pre-existing tubercular lesion.

Further, apart from the three common clinical symptoms of tuberculosis of the udder, viz, enlarged supra mammary lymphatic gland, indurated quarter, and irregular nodules in the gland substance, there is a fourth form of udder tuberculosis, namely, small nodules in the mucous lining of the milk tubes, and these may break down, and their contents be mixed with the milk. In view of the more recent investigations it is evident that clinical examination alone cannot be relied upon for the detection of udder tuberculosis,* and that the only reliable method is by the inoculation of the milk into experimental animals.

Significance of Bovine Tubercle Bacilli in Milk.

It is now established beyond doubt that there are two chief types of tubercle bacilli, human and bovine, which are differentiated by their cultural characters and different pathogenic properties. It is suggested, and not without reason, that the two types are simply varieties evolved by environment. Some investigators have been able to considerably modify the human type by passage through animals, so that it acquires many of the characters of bovine bacilli. It is an equally well established fact that the bovine type of bacillus is pathogenic for man, while the human type is pathogenic for bovine animals, although with a less degree of virulence.

The Royal Commission on Tuberculosis, in their Second Interim Report, state:

> "There can be no doubt but that in a certain number of cases the tuberculosis occurring in the human subject, especially in children, is the

* Third Interim Report Royal Commission on Tuberculosis, 1909, p. 14.

direct result of the introduction into the human body of the bacillus of bovine tuberculosis, and there can also be no doubt that in the majority at least of these cases the bacillus is introduced through cow's milk. Cow's milk containing bovine tubercle bacilli is clearly a cause of tuberculosis, and of fatal tuberculosis, in man."

In their Final Report, 1911, they are even more definite:

> "There can be no doubt that a considerable proportion of the tuberculosis affecting the children is of bovine origin, more particularly that which affects primarily the abdominal organs and the cuvical glands."

The Commissioners sum up as follows:

> "We prefer to regard these two types as varieties of the same bacillus, and the lesions which they produce, whether in man or in the other mammals, as manifestations of the same disease."

While in the case of infantile tuberculosis the bovine type of bacillus predominates,* in adults the human type prevails; and since the differences between the types of bacilli are differences of degree only, it is a reasonable supposition that bovine bacilli ingested during early life may, under the influence of a human environment, be modified in type, the result being that when these organisms are isolated, although originally of bovine origin, they will exhibit the characters of the human type. A consideration of all these facts makes it evident that the sooner that one or other of the methods of eradication of bovine tuberculosis is adopted, the sooner will it be possible to decrease the mortality from the great white plague.

MILK-BORNE EPIDEMICS.

It has been said, and rightly, that no two milk-borne epidemics are alike. So that it is not possible to lay down any hard and fast laws of pathognomic significance, nor are there any definite signs which never vary. In most epidemics traceable to milk the disease has followed the line of distribution. The area of infection varies: it may be restricted to a group of houses in a certain area, or may embrace several streets, or a whole district. Usually the upper classes are affected to a greater extent than the lower classes, for the simple reason that whereas in the poorer homes the milk is only taken with tea or some other beverage, the more wealthy consume considerable quantities of milk either raw, or only slightly warmed. Again, in the larger houses the milk is stored for a longer period than is the case in the more humble dwellings where the inhabitants live from hand to mouth and purchase a small quantity as it is required. Hence in the former case there is more opportunity for the milk not only to become infected but for the existing organisms to

* Lewis, Trans. Sixth International Congress on Tuberculosis, Washington.

rapidly increase in number. Another general sign of a milk-borne disease is that it attacks the members of a family who drink most milk, for this reason one finds that women and children are more commonly affected than are men. Further, the period of incubation in different epidemics due to the same organism varies, and as a whole the time which elapses between the infection and the first evidence of the disease is shorter when the virus is milk-borne than when some other agent is employed as a carrier. Whereas, for example, the incubation period of scarlet fever and diphtheria normally contracted varies from three to five days, in a milk-borne epidemic there may be evidence of the disease in a few hours, and in the case of typhoid fever a few days. Still even this varies and is not a reliable indication of milk infection. It must be remembered that where organisms have been multiplying in milk their toxins are produced there instead of in the human body, and for this reason the case may, and frequently does, resemble an intoxication rather than an infection.

Scarlet Fever.

When conveyed by milk this disease has shewn modifications of a more or less marked character. The disease is generally of a mild form, and a large number of ordinary sore throats are frequently found in conjunction with an outbreak of the specific disease when milk is the vehicle. According to Power, in scarlatina the disease is often confined to the throat, while the rash may be evanescent, and the desquamation scanty (Parsons). The part played by the cow in the transmission of scarlet fever formed the subject of a heated controversy in 1885, at the time of the North London and Hendon outbreaks, and this has been revived from time to time as fresh outbreaks occurred. Klein and Power laid the onus definitely on the cow in the outbreak mentioned, describing lesions found in the udders of three of the cows whose milk was being distributed in the affected area, and assuming that these lesions were peculiar to the affection, there are no grounds whatever for assuming that this vesico-pustular eruption on the udders and teats is peculiar to, or indicative of, scarlatina in the cow. Klein attached great importance to the co-existence of ulceration, scabs, and localised alopecia, but in some subsequent outbreaks which were attributed to cow infection, as for example the 1909 London epidemic (Drs. Hamer and Jones) and that of Glasgow 1892 (Drs. Russell and Chalmers), the skin lesions were absent. Further, the experiments carried out by Klein to identify the streptococcus from the udders and teats as the cause of scarlet fever were incomplete, and it is hard to understand on what grounds Klein considered himself justified in arriving

at the conclusion that his streptococeus was the organism responsible for scarlet fever, since organisms indistinguishable from it can be demonstrated in the throat of persons suffering from other acute catarrhal conditions.

It was suggested in the London epidemic of 1909 that the cow scarlatina had its origin in feeding cake, which is so highly improbable as to be unworthy of note. The only cases in which the cow has been accused are those in which it was not possible to trace the human origin of the disease, and when one considers the grounds that infected persons would have for suppressing the fact and remembers the ignorance of the class of people most likely to be concerned in the infection, it is easy to understand how the most important facts may never come to the knowledge of the persons interested with the investigations. When one reviews the number of cases proved to be due to human contamination, one cannot but be struck by the way in which they outnumber those cases whose origin was not discovered and hence attributed to bovine scarlatina. It seems possible that scarlet fever, like swine fever and canine distemper, is due primarily to infection by an ultra-visible virus, and that the streptococcus is the accidental organism, which, although normally present in the throat as well as other parts of the body, gives rise to the secondary lesions. There is not one tittle of evidence to show that an ulcerated condition of the teats and udders of dairy cows is a predisposing factor in the transmission of the disease. The mere fact that in some cases of scarlet fever epidemics, cows showing such lesions were found in the suspected byres was probably nothing more than coincidence. It is rare to find a dairy in which some of the cows do not show lesions of a similar kind, and one would not be in any way surprised to find streptococci in such lesions. Moreover, although some cows did possess sore or ulcerated teats or udders, it was not proved that the milk of those cows was capable of causing scarlet fever any more than the milk of the cows which did not exhibit udder lesions. It is almost certain that the infection in every case came from outside, and that the cows did not even harbour the virus (?) of scarlet fever. There now seems to be no doubt that cow's milk plays an important part in the transmission of scarlet fever, but that the cow does not suffer from the disease.

Diphtheria.

Although in the case of scarlet fever there was some excuse for doubt concerning the part played by the cow in the transmission of the disease, yet in the case of diphtheria no such error is possible. This is due chiefly to the fact that in the latter disease the causal organism is well

known, and easily recognised. Probably one reason why this disease was ascribed to the cow was due to the fact that the causal organism may not leave the body of the affected person for several weeks, and hence such a person is a carrier of the disease during that period, in which case it is not easy to trace the infection to an outside source. Moreover, the organism may cause no more than a catarrhal cold, and yet under favourable circumstances it can become more virulent and set up diphtheria. Further it has been shown that in apparently healthy persons who have not suffered from diphtheria the Klebs-Löffler bacillus may be present in the throat. Löffler found diphtheria bacilli in the throats of four out of 160 children, and Park and Beeba found similar virulent bacilli in eight out of 330 healthy throats.* Hewlett and Murray found 15 per cent. of the children in a general hospital had diphtheria bacilli in their throats. Where there are outbreaks of diphtheria one always finds people suffering from colds. Since the discovery of the Klebs-Löffler bacillus, attempts have been made to show that that organism can cause mastitis in cows, but all attempts to demonstrate this fact have failed. It is almost certain that the organism with which Klein experimented by inoculating cows in the shoulder and producing systemic disarrangement with the appearance of the organisms in the milk was not the Klebs-Löffler bacillus at all, but a similar organism which was non-pathogenic to man.

Its chief difference is in the fact that it was present in the milk, indicating a septicæmic condition, while the true diphtheria bacillus on inoculation remains localised, and further, that while Löffler never succeeded in obtaining growth of his bacillus at ordinary room temperature, and was unable to grow it in gelatine, those that Klein described as occurring in the pustules on the ulcerated udder of the cow, grow luxuriantly in gelatine, and at ordinary room temperatures. Other investigators (Dean, Todd, Ashby†) have isolated diphtheria bacilli from ulcers upon the teats and udders of cows whose milk was supposed to have caused an outbreak of diphtheria. The authors came to the conclusion that the lesions in the cow were not due to the diphtheria bacillus, but that the ulcerated patches formed a convenient habitat for those organisms. Jensen‡ considers that "the opinion that was formerly held by some that diphtheria in man could come from a disease of milch cows is entirely erroneous," while M'Fadyean§

* Swithenbank & Newman. "Bacteriology of Milk."
† Jour. of Hygiene '02, II. pp. 194. Public Health '06 XIX., pp. 145.
‡ Milk Hygiene, pp. 114.
§ Jour. of Comp. Path., III., pp. 166.

says "no one having a knowledge of the diseases of our domestic animals can for a moment believe that this is the direction in which to look in trying to trace the cause of human diphtheria."

TYPHOID.

Several epidemics of typhoid fever whose origin was traced to milk which had been contaminated with typhoid bacilli have been reported from various parts of the country during the past few years. Where the water supply is not the source of the infection, milk is perhaps the agent most frequently blamed. Some doubt existed at first concerning the part played by milk in the transmission of the disease due chiefly to the fact that the typhoid bacilli could not be found in it, recent observations, however, have shown that milk can, and frequently does, act as the carrier of the disease. In epidemics where it was not possible to trace the infection of the milk to some sick person connected with the farm, and yet the particular farm was clearly indicated as the seat of the infection, an endeavour was made to connect the infection with a disease of the cows, but unjustly, for there is no case known of disease in the lower animals due to the typhoid bacillus. Apart from direct contamination from some person suffering from the disease, or convalescents, milk may become infected with typhoid bacilli as a result of the addition of contaminated water, or such water having been used for dairy purposes. Water from shallow wells and surface streams is liable to become contaminated directly or indirectly through carelessness or from sewage. Typhoid bacilli may be blown about in dust, carried on boots, by small animals and flies. Bacilli ingested by cows through the drinking of infected water pass through the intestinal canal, and are voided in the fæces, whence they may easily gain access to the milk either by contamination with dust composed of dried fæcal material or by some of the contaminated bodily filth falling into the milking pail or soiling the milker's hands. In no case are the bacilli voided in the milk. For these reasons epidemics of typhoid fever traceable to milk are found usually to originate from country dairies rather than from those in towns, and this is another reason for the inspection of country dairies being as rigorous as that of those in towns.

SORE THROAT.

There are on record several epidemics of sore throat apart from the sore throat of scarlet fever and diphtheria, which were traced to milk. Associated with these epidemics eruptive conditions of the udders and teats of the cows supplying the suspected milk were noted, and from some of

these, Savage* has isolated a streptococcus. To confirm this he examined the streptococci found in 16 cases of sore throat, and demonstrated two types, one of which had been named *S. anginosus*, and the other was indistinguishable from *S. pyogenes*. Culturally and morphologically *S. anginosus* resembles *S. mastitidis*, but shows a greater virulence for small animals, and in some later experiments Savage found that *S. mastitidis* set up mastitis in goats when injected up the teat canal, while *S. anginosus* did not. These results suggest that an important difference in functional power separates the types and that under ordinary conditions *S. mastitidis* does not cause disease in human beings. Savage inoculated his throat with large quantities of *S. mastitidis* on two occasions, but without any local or general ill effects. From a pathological standpoint it would seem that the majority of cases of bovine mastitis are due to an organism which is not harmful to man, which accounts for the fact that while bovine mastitis is common, sore throat and other septic outbreaks from milk are rare. It seems certain that in this case as in others the causal organism is not present in the milk at the time that it leaves the udder, but rather that the infection of the milk is due to contamination from an outside source, such as an existing case of sore throat.

Epidemic Diarrhœa.

Delépine† records having isolated from milk causing intense diarrhœa in children and adults, a bacillus identical with one causing fatal septicæmia in guinea pigs after injection with mixed milk. It resembles *B. coli* in pathogenic action, mode of growth, size, shape, and motility, and its discoverer is of opinion that it is a pathogenic variety of *B. coli.* Booker believes that three principal forms of summer diarrhœa in infants can be distinguished, dyspeptic, or non-inflammatory diarrhœa, staphylococcus gastro-enteritis, and bacillary gastro-enteritis, and that no specific organism is found to be the cause of the disease, but that it is generally to be attributed to the result of the activity of a number of varieties of bacteria, some of which belong to well-known species, and are ordinarily present, the most important being *S. enteritidis* and *proteus vulgaris.* Another organism, according to Klein, is *B. enteritidis sporogenes*, a ubiquitous organism occurring in normal fæces, sewage, manure, soil, dust and milk. Other investigators conclude that *B. coli*, either alone or in conjunction with other organisms, has been the cause of epidemic diarrhœa. Cumston, as the result of investigations concluded that

* "Milk and the Public Health," pp. 108.

† Jour. of Comp. Path. '97, Vol. X.

B. coli associated with *S. pyogenes* was the chief pathogenic agent, and that its virulence was exalted by the combination. Lesage in testing the agglutination property of the serum of children affected with the disease obtained a positive result in 80 per cent. of the cases. Delépine* considers that in most cases the disease is the result of the infection of food by an organism of the colon group, and that milk is the most common cause, becoming infected either at the farm or during transit. On the other hand there is overwhelming evidence in support of domestic infection; numerous investigators have traced the contamination to this source, and moreover, numerous cases have occurred where the individual was fed on condensed milk, and in children that were breast-fed. The fact remains, however, that the disease is of bacterial origin, although the source of the organism is at present somewhat obscure. It is evident that our knowledge of the bacteriology of epidemic diarrhœa is at present incomplete, and three reasonable suppositions present themselves:

1. It may be that the whole group of choleraic, enteric, and diarrhœal diseases are caused by a group of micro-organisms closely resembling each other in many respects; (2) that the different forms of diarrhœa have their own specific causal organism; or (3) it may be a question of the association of organisms that brings about the disease.

Anthrax.

Chamberland, Roux, Nocard, and others, have observed that the milk of cows affected with anthrax contained virulent anthrax bacilli. It does not follow, however, that all cows affected with the disease secrete the organisms in their milk. Cows that appear healthy give milk free from bacilli, even though they are affected. It is only during the last stages of the disease, after it has become septicæmic, that the organisms are present in the milk. Their presence is accounted for by the possible occurrence of hæmorrhages in the udder.

Foot and Mouth Disease.

Owing to the comparative rarity of outbreaks of this disease in the British Isles, and when it does occur, to the early diagnosis and drastic methods adopted for its suppression, there are but few cases of human infection on record. In view, however, of the recent outbreaks occurring in the North of England, it is well to remember that the infection can be conveyed to human beings, both from the udder of the affected cows and by the milk. The vesicular lymph is extremely virulent, and the disease is spread by inoculation. In the case of milkers, the hands and mouth are

* Swithenbank and Newman.

usually affected, while where milk is the vehicle the mouth alone is the common seat of the disease, the virus entering through the mucous membrane, especially if there be any break in its continuity. This virus was responsible for the outbreak at Dover in 1884, in which some 205 persons were attacked in all, four cases being fatal, possibly as the result of secondary infection.

Malta Fever.

Since cows are susceptible to this disease, and the micrococcus militensis has been demonstrated in their milk, it is conceivable that they may be a means whereby the infection is spread, although there do not appear to be any cases of such an infection recorded.

Actinomycosis.

This disease of the udders of cows is distinctly rare; but since man may be infected through inoculation of the mucous membrane of the mouth, the milk of such cows should not be used for human consumption.

The Germicidal Property of Milk.

It was noted, as long ago as 1890, that fresh milk possessed the power of inhibiting the growth of bacteria, the number of organisms actually decreasing during the first few hours of its leaving the udder. This phenomenon was explained by ascribing a germicidal property to fresh milk. Of late years, however, some doubt has arisen in connection with this power of destroying organisms. Stocking concluded that the decrease was due, not to any specific germicidal property, but rather to the fact that many organisms dropped out simply because they did not find the milk a suitable medium in which to multiply. Others again have suggested that the apparent decrease in numbers may be due to the fact that some of the bacteria become agglutinated into clumps, and as each clump produces only one colony, the bacteria are apparently diminished in number. It is highly probable that all three factors take part in the decrease in number.

Notification of Death of the Lower Domesticated Animals, by A. H. Archer, M.R.C.V.S.

THAT compulsory notification of the death of each animal which is intimately associated with the lives of human beings would play an important part in the preservation of health, there can be little doubt, and this is why I introduce this subject for discussion, especially as with the exception of carcases killed for food for man, it has received but scant consideration at the hands of the medical profession.

It is more especially with those cases that die from disease, or accident, and the effect that compulsory notification would have on the treatment of subjects during life, the disposal of the carcase, or parts thereof, after death, and the bearing these have on the life and health of human beings, that I refer to.

It is common knowledge to veterinary surgeons practising in country districts, that very many animals die, some even of virulent or contagious diseases, and the carcases are disposed of in a most haphazard manner, without any publicity being given to the fact, or proper precautionary measures taken, so that other owners of stock have no warning to prevent their own animals becoming victims in a similar manner.

Also, it is equally well known, that it frequently happens, when an animal shows signs of illness that it is dosed, or otherwise treated in a manner which causes the patient intense suffering, sometimes even attended with fatal consequences.

Such practices are actuated by either gross ignorance, despicable cupidity, or inexcusable callousness, and it is surprising that such a state of things should exist, or be tolerated, and even, in some cases, encouraged by persons who hold high, responsible positions.

I will mention some cases which have come under my own observation.

1. Called to attend a cow in good condition, suffering from a sudden illness. As there was no improvement in a few hours, the manager had her slaughtered and dressed for sale for food. I saw the carcase, and expressed an opinion that she had been affected with anthrax, immediately advising the butcher to take steps accordingly.

The carcase, etc., was buried in lime, knives, etc., scalded; and beyond a sow dying which had partaken of the offal and the butcher himself getting a bad arm, no further trouble occurred.

2. Attended a farm to make a post mortem examination of a pig which had been found dead that morning. Two police-officers were present

when I arrived, and, as I afterwards discovered, a report had been sent to headquarters that it was a case of swine-fever.

On seeing the carcase, I said it was, to the best of my belief, a case of anthrax, which proved to be correct, but as the police-officers, in reply to questions subsequently asked, informed the authorities that I had seen the case, they (the authorities) were consequently led to believe that *I* had said it was swine fever. No precautions had been taken in connection with anthrax until after my arrival.

This case was distinctly traceable to dirt on acorns, as being the medium through which the anthrax-bacilli had been conveyed to the pigs. These acorns had been picked up by villagers, and bought by the farmer for food for the pigs. How easily might one or more of the villagers have become affected!

3. One very hot day in August a cow was observed to be ill, with what at the time was thought to be sunstroke. Being in excellent condition the owner decided to have her slaughtered, the carcase being dressed in the usual way at the farm.

By the merest chance, later in the day I obtained a little of the blood, and by microscopical examination found it to be a case of anthrax. The owner was informed, but it was too late to prevent serious consequences to the butcher who dressed the cow, he being taken so ill that his life was despaired of, and although he eventually recovered to some extent, he was never the same man again in respect of health.

Two sows were affected by eating a small portion of the blood or carcase, one of which died.

The owner neglected to destroy the carcase immediately (this was before the existing regulations came into force), with the consequence that, when this was done, all the men, three in number, who assisted became ill, and the owner himself, who superintended the process, suffered for months afterwards.

These are only three cases out of a great number, more or less similar in character and circumstances, which have come under my notice during thirty-five years of practice.

Of course compulsory notification would necessitate a re-arrangement of the system of inspection. At present a considerable percentage of inspectors of animals are neither properly qualified, nor are capable of making a reliable report from microscopical examinations.

I propose that the stockowners should be supplied with a book of forms stating the course to be adopted when an animal dies, one form to be suitably filled in on the death of each animal, the cause of death being

attested by the signature of a duly qualified veterinary surgeon who either attended the animal during life, or made a post-mortem examination. In cases of doubt a district inspector should be called in to give an opinion on the case. Each form should be sent to a person appointed to receive the same, who should see that it is properly filled in and signed.

If some such course were brought into force, it would have the effect of checking injudicious and improper use of proprietary medicines, etc., and also ensure the proper disposal of diseased carcases, and so do away with a source of danger to life and health of persons which now exists in our midst to a far greater extent than is realized.

MR. HUGH BEGG (Lanark C.C.) explained that in Lanarkshire since 1907 they had the advantage of the Diseases of Animals (Lanarkshire) Order, which was given effect to in a thorough manner. Shortly put, the Order provided that owners must report the illness or death of any head of cattle to the county clerk or nearest constable, except in the case of (i) illness or death produced by or consequent on accident or calving, or (ii) where the illness was certified by a veterinary surgeon as not being cattle plague, pleuro-pneumonia, foot and mouth disease, or anthrax.

Under the Anthrax Order of 1911 an owner's safety lay, in the event of the sudden death of an animal, to presume the presence of anthrax until the contrary was proved, and the notification of the authorities cost him nothing. In Lanark, if an owner reported by telegram, the cost of it was sent to him at once by post. It was Mr. Begg's duty to attend to all these cases. He took a microscope with him, examined the blood at the farm, and in the event of the case being one of anthrax, he at once plugged the carcase, arranged for its removal in a special vehicle to a digester, and instructed the police as to disinfection. He made one or more subsequent visits before removing restrictions.

MR. A. H. ARCHER (Southsea) suggested that each county council or other representative body should acquire a selected farm, and that all cattle be inspected periodically, and submitted to the tuberculin test when suitable. Those animals that reacted to this test or were otherwise deemed, by a qualified and competent veterinary inspector, to be affected with tuberculosis, to be *purchased*, at a price determined by a competent valuer, who should take into consideration, after consultation with the veterinary inspector, the extent of the disease when making his award.

The animal so purchased (by the county council) to be drafted into the hospital farm when it should be dealt with on its merits. Bad, clinical cases should be at once cremated. A cow giving a sufficient quantity of milk to warrant it, might be kept alive, and her milk sterilised and used for pig and poultry feeding, calf-rearing, etc.

A case which had reacted to the test, but showed no other definite clinical symptoms, might be at once slaughtered if in good condition, a careful examination made of the carcase, and if the disease were found to exist in a mild localised form only, the flesh could be safely used for food, on the same lines as now adopted in their large cattle-slaughtering centres. If it were considered in these cases, that the animal would sufficiently improve in condition by good feeding, etc., such a course could be adopted for such time as deemed expedient.

These hospital farms could be used for many other useful purposes, such as experiments in feeding, cropping, manuring, etc.

He submitted that such a scheme could be utilised to distribute the burden of loss fairly between all parties most directly concerned from a financial point of view. The stockowner would contribute his share to the public cause, by the decreased amount of value of the animal. The local authorities should pay for the initial examination of the cattle, the disinfection of premises, etc., and in this way the local ratepayer would supply his share. All loss and expenses incurred as soon as the animal has entered the hospital farm, together with the purchase price of the animal, should be borne by the Imperial Exchequer, through the medium of the county council.

Only thoroughly competent and qualified inspectors should be employed, and the management should be under the guidance of experienced, practical persons.

Australian Conditions, by William George Hoole, Mem. Syd. Tech. Coll. Assoc., Principal Sanitary Inspector, City of Broken Hill (Associate).

Abstract.

THE statistics of Sydney at the last census in 1900 showed a population of 605,900 (exclusive of the adjoining suburbs), and thus in regard to population it ranks seventh on the list of cities of the British Empire. Its death-rate from all causes is only 10·16 per 1,000, less than London with 13·82 and New York with 16·5. The "City of Sydney" proper has an ideal system of sewerage, and many of the adjoining suburbs are now linked up, and others will follow suit as the funds of the State become available for the purpose.

Since the installation of a complete sewerage in Sydney the mortality from diphtheria fell from 5·2 to ·3 per 10,000 of the population.

Before completion of the sewerage the mortality from diarrhœa was 10·9, whereas in 1900, after installation was completed, the rate fell to 2·9 per 10,000; the enteric or typhoid mortality per 10,000 before the completion of the sewerage was 25·34 and after completion 6·36.

Sydney and the surrounding districts have a natural drainage towards the ocean, into which all the sewage is eventually conveyed.

The abattoirs of Sydney are controlled by the Department of Public Health; a qualified veterinarian is the superintendent, and under him are nine qualified meat inspectors. The stock sale yards are under the control of the Agricultural and Stock Department, and all stock sold are inspected by the Department's inspectors, all of whom have to be thoroughly qualified men. In addition, there are stock and dairy inspectors from the two Departments aforementioned, who are continually travelling the country, inspecting the dairy herds and piggeries and farms where the stock are bred, so that the public are efficiently protected from the consumption of meat or milk unfit for food. There are also meat and food inspectors and sanitary inspectors who watch over the meat and food exposed for sale.

The City of Melbourne (Victoria) and the City of Adelaide (South Australia) are similarly worked, but not so extensively as Sydney.

City of Broken Hill.

During the summer months flies and mosquitoes abound; the present water supply (controlled by a private company) for this city is very inadequate, and the price is almost prohibitive to many of the poorer classes. The price is 5s. per thousand gallons, which means that laundry work and personal ablution is not so regular as could be desired.

Sanitation.—The nightsoil is removed by the Municipal Council (a charge of 6d. per service to each occupier being made), partly by the day system, by the duplicate or sealed pan system, and partly by the single pan and night cart; the excreta is disposed of by burial in trenches on a piece of land about 10 acres in extent, which has been acquired by the Council some three miles from the centre of the city. The liquid wastes, including urine, soapsuds, etc. (except that which is surreptitiously disposed of into lanes at night) is placed in cemented pits and other receptacles for removal by the Council (at 4s. per 240 gallons), and is run over the ground at the depot, or buried if time allows.

The garbage is removed as follows:—Two cubic feet removed weekly is allowed free for every sanitary service; over two cubic feet special arrangements are made with the householders for removal. There is no destructor; the garbage, including tins, straw, and refuse of all kinds, being carted to a central point on the commons, where it comprises heaps of many acres in extent, and about 1 foot to 10 feet high. The mode of locomotion is principally by horse. This means a vast amount of manure.

OBITUARY.

JOHN FREDERICK JOSEPH SYKES (FELLOW).

Born January 7th, 1854; died January 28th, 1913.

Dr. John F. Sykes was the son of John Sykes, of Marylebone, and Mary Eflat, of the Hays of Bremerside, N.B.; he had three brothers—one alone survives.

As a young man, Sykes was fortunate in being able to be a student in France, Germany, and Edinburgh; in this way he easily and pleasantly acquired a good knowledge of both French and German, and by the time he took his medical degrees, he had a far wider and more intimate knowledge of men and manners than other young men of similar age who did not possess the advantages of continental study. His first medical qualifications were taken in 1878, M.R.C.S. and L.R.C.P.; in 1893 he took the D.Sc. and M.D. degrees Edinburgh.

In 1881 he married Jane, the daughter of John Reynolds of Brighton—Mrs. Sykes died only about a year ago, and Dr. Sykes felt her loss keenly. There is one son and a daughter remaining.

Of the fifty-nine years of his life, no less than twenty-eight were occupied with the arduous duties of Medical Officer of Health to St. Pancras, and in this office he showed great administrative abilities, and retained the support and confidence of his Council and Committees, and the affection of his staff.

Dr. Sykes was a prominent sanitarian and as such was a Member of Council of The Royal Sanitary Institute practically from 1883 to 1907; he was an Examiner from 1886 to 1899; and served at different times on the Congress, Referee, Education, Museum, Finance, and Parliamentary Committees. He was a good debater, courteous in manner, and studied with great assiduity any special matter he was interested in, and never failed to make valuable and often original suggestions.

In 1900 he was awarded the Howard Medal by the Royal Statistical Society; in 1901 he was Milroy lecturer of the Royal College of Physicians. He wrote a considerable number of contributions to sanitary science: they are mostly found in the Journal of The Royal Sanitary Institute and in the Journal of the Society of Medical Officers of Health.

He led a busy useful life. His death is premature: at 59 years of age such men as Dr. Sykes are in their prime; but a latent malady of some years' duration weakened his powers, and he died a few days after an operation.

We all miss the cheery presence of our confrère, and feel that his early decease is a public calamity.

A. W. B.

Volume XXXIV. No. 3. **Issued April, 1913.**

JOURNAL

OF

THE ROYAL SANITARY INSTITUTE

CONGRESS AT YORK.

CONFERENCE V.—SANITARY INSPECTORS.

Presidential Address, by T. G. DEE, Sanitary Inspector, Westminster, President of the Conference (ASSOCIATE).

THE enforcement of regulations, made to enable Nature's laws to obtain full fruition, for the benefit of the teeming population of our nation, is the essential factor in the existence of the office of sanitary inspector.

It will be well therefore that we consider how, in our times, the infringement of those laws led to State interference with the liberties of the people, and to trace in the development of that principle the steps by which we have reached the position of to-day.

The experience of past years is the basis which we must use if improvement and real progress is to be obtained in the objects we have in view, therefore a full knowledge and appreciation of the factors that make for success or failure in public health work is obviously our first duty.

Our sanitary laws are promulgated with the object of so regulating the lives of our people that Nature's products, air, food, and water, may be supplied to each and all, in such a manner and under such conditions that every human being's vital force may be maintained at its maximum.

Nature has no sympathy to be awakened; as you sow so shall you reap, is obviously her law.

Gardiner, in his History of England, records that in 1830 to 1840, "in Manchester one tenth of the population lived in cellars, dark and filled with a horrible stench, that in Bethnal Green things were quite as

bad, whilst overcrowding added to the horrors of such a life," and again, "that in one parish in Dorset, on an average, every house contained thirty-six persons;" whilst wheat was at a much higher price than to-day, and the water supply, even in London after 500 years of State regulation, so bad that the intakes, from the Thames, of some of the water companies were in close proximity to the outfalls of the sewers.

Under these circumstances, unfortunately typical of England as a whole, it is not surprising to find that it was decided that the liberty of the people to live under conditions in which it was impossible to obtain air remotely approaching purity was prohibited, and an officer created with the duty of "inspecting and reporting the existence of nuisances injurious to health."

It is needless to recapitulate the well-known steps by which the removal first of the gross nuisances of obvious filth, and later, by the wider application of the term "injurious to health," which had been made scientifically possible by the experiments and researches of Dr. E. A. Parkes (in whose memory the museum, maintained by The Royal Sanitary Institute, was founded), and his contemporaries, to other less obvious nuisances, led to the reduction of England's death-rate by one half, and incidentally, but explanatory of the extended scope of our work, to the alteration of our title, either legally or by general acceptation, to that of "Sanitary Inspectors." I only claim that we have done our duty, that our practical diffusion of the knowledge of Nature's laws by every-day work is a proof that we have acquired knowledge and given forth from that knowledge sparks, which have kindled the flames of a cleansing and purifying fire which is now well alight, and burning brightly and steadily throughout the length and breadth of our land.

Fire is, however, a good servant, but a bad master; fire requires fuel, which should be applied so as not to cause a nuisance, but in such a manner that, without undue cost, it carries out its work well; for which purpose good stokers are necessary.

When the natural factors of heat, fuel, and wind act in full vigour there is an enormous display, attractive by its force and magnificence, but frequently wasteful and useless, nay even dangerous. When, however, under proper control it effects useful changes, whether by the application of great heat in bringing masses of metal into useful shape, or in the preparation of a simple meal, its work may be less attractive, but it is of real use, and that use is brought into existence by the worker who uses and directs Nature for the benefit of himself and his kind.

In like manner, then, I ask you to consider with me the future of our nation's health, and the part we have to play in moulding the various factors so as to produce both the great and small results which make, or mar, our health and happiness.

A practical knowledge of the factors at work must include that of the changing disposition of our people, which change has been continuous throughout the period I have briefly reviewed, and which largely arises from the acceptance of the doctrine of regulated liberty and the restriction of individualism, which has taken place as a resultant of the improved health due to the enforcement of laws restraining individual actions, not necessarily criminal, but which have a tendency to result in injury to the community.

For sixty years sanitary inspectors have worked against the individual, in the interest of the community, firstly, by enforcing laws restricting that individual's right to pollute air, food, or water by a definite act of his own volition; secondly, by interfering with the liberty of an individual unfortunately suffering from ill-health, communicable to the community; thirdly, by regulating the management of the infant as early as possible after birth.

Our people have thus become accustomed to the restriction of individual liberty, in the interest of the race, even when no personal fault has given rise to those restrictions, thus paving the way for the new era of public health work, the restriction of the rights of parents as individuals to determine the medical examination and the general treatment of their offspring.

Under the new conditions thus set up, unless we are to lose touch with public health work, it is essential that we add, to our knowledge of air, water and food in their application to the individual, a knowledge of the community as a whole.

We note that under individualism, the clergy and the district visitor played an important part in moulding the character, in ameliorating the physical ills, and in regulating the pleasures of the community; whilst in common with other charitable work, hospitals were founded and maintained at the will of individuals, whose wealth was diverted, at their own pleasure, in providing remedial measures for the broken health of their fellow citizens, and for the education of doctors and nurses.

Communal life was for those who had failed, and who had been relegated to workhouses, or in consequence of the special claim of a common ill were gathered together in institutions. These communities

were kept well restricted by the dominating individualism of the heads of the establishments, and many inmates, rather than lose their freedom in this way, expressed their determination to die.

The formation of various societies (such, for example, as the Society for the Prevention of Cruelty to Children, and that for the Protection of Women and Children) were amongst the earlier voluntary efforts to enforce the criminal law; necessary, because its enforcement had been neglected by the appointed authorities. These societies were potent factors in restricting the individuality of those possessed of cruel or criminal tendencies, by the enforcement of the communal right of the individual victim, and thereby individualism was discredited.

With the avowed object of enlightening the country generally in the various methods by which the dominating individual was restricting the rights of other individuals with respect to their food or shelter, or unduly exploiting their physical capacity, many societies have been formed during the latter portion of the sixty years we are reviewing.

To-day, therefore, we find many sections of the community banded together for the enforcement and advertisement of the public health rights of the individual, such as The Royal Sanitary Institute, the National Health Society, etc., together with an increasing number, whose definite object is the special treatment of one phase only of the great question of healthy happiness, which object is usually set out by their title, *e.g.*, "Garden Cities, "Rural Housing," "Physical Education and Improvement," "Sanatorium Treatment," "The Welfare of the Feeble-minded," "School for Mothers," "Child Study," "Eugenics," "Wage-Earning Children."

These various bodies are individually or collectively conferring in public on questions of vital interest to the community, all strenuously advocating the necessity of limiting individualism where, in their opinion, it adversely affects the community; and incidentally the question of one form of individuality, that of the successful business man, whom in my early days we were urgently exhorted to emulate, has been pilloried, not only by the present unrest of labour, but coolly, calmly by Dr. F. W. Mott, in a lecture to The Royal Sanitary Institute, on Sanity and Insanity, in which he makes the following remark: "Successful men in the eyes of the world may really be degenerates; not infrequently so-called self-made men form the first step in the process of degeneration. The selfishness and meanness, or the cunning, avarice, and moral guile by which they have succeeded in selfishly amassing a huge fortune, for their children to spend selfishly, is the first evidence of degeneracy . . . the

children possessing the same selfish instinct . . . . not infrequently terminate their careers in the madhouse or prison."

A factor of extreme importance, and which has developed enormously during the period under review, is the great change in the attitude of women: their individualism was wont to lose itself in the family circle, frequently shedding light and lustre on all within its influence, whilst maintaining the place and sacredness of mother (or whilst preparing to fill that place), influencing the individualism in her children.

To-day women loom largely in the business world, the break up of the individual home and the wider influence communal women desire is indicated, amongst others, by the Women's Imperial Health Association, the Women's Industrial Council, whilst others more extreme, as free women, go so far as to suggest refusal to fulfil their place in Nature's economy, and that in such terms as: "Marriage is the formal repudiation of freedom," "That deliberate abrogation of the essentials of freedom which we call Marriage." "What then is the motive which leads men and women to abrogate their freedom? It cannot be love, for love flourishes better unflecked by marriage than when bound by it." "A very fair proportion of modern woman's movement is animated by the desire to throw off completely that part of the marriage bargain which has to do with sexual coercion, *an extraordinarily healthy sign.*" "The marriage law rests upon two pillars, sexual coercion and maintenance, both of which are self evidently immoral." "Polygamy, polyandry, monogamy, and promiscuity in the sexual relations are not in themselves either right or wrong, except in so far as the particular circumstances in which they are exercised determine."

The management of the child during his development has been revolutionised; the grand old text book states that "The rod and reproof give wisdom," "Correct thy son and he shall give thee rest, yea, he shall give delight unto thy soul," "Children's children are the crown of old men and the glory of children are their fathers," "My son, hear the instruction of thy father, and forsake not the law of thy mother."

Under communal child management, the responsibilities of parents are gradually but surely lessened, the right to administer the rod, the duty to train, by early instruction and initiation, the increasing power for work as it develops in the child is limited by law, by medical inspection, by licensing authorities, and societies, whilst its individuality is drawn out in school by the State instruction that the teaching shall not be of the old parrot-like nature, but such as shall interest and develop the awakening powers of the children.

Having thus ascertained something about the changed conditions which have arisen in our people's management of themselves, it now behoves us to apply this knowledge in the exercise of our duties.

How are we to bring ourselves into line with respect to the variation taking place, so that whatsoever is best for our work shall predominate? how shall we, as individuals, comport ourselves so that our individuality shall align itself with the communal interests of sanitary inspectors?

The public health of our nation is now, as I have already stated, the subject of interest to many societies, each combined to force special attention to that particular phase which, in their opinion, is not receiving all the care it deserves. Child study, the abatement of smoke nuisances, the provision of public abattoirs, etc., good things as they are in themselves, may become harmful if given undue prominence. We must guard against viewing the whole work of public health through distorted glasses.

We should, however, as far as lies in our power, keep in touch with local care committees or health societies, so that the voluntary part of the work may be fully known to us, and its actual value duly appreciated.

Parliamentary supervision of the health interests of the community, acting under Cabinet guidance, has dealt with many diverse factors which tend to improve conditions of comfort, and realising that voluntary efforts of amelioration are spasmodic and entirely dependent upon individualism, two recent measures have been brought into existence, one of which deals with the restriction of the accumulation of wealth by unearned increment, and arbitrarily determines the proportion of that wealth which is to be allocated to the community; and the other with the removal of the individual right to determine whether or not one shall provide for possible future illness or breakdown, and incidentally institutes a precedent for providing hospital accommodation communally, by first providing for that class of illness which at the moment is receiving the greatest amount of philanthropic attention.

The National Insurance Act of 1911, now in force, deals by Part I. with National Health Insurance, and so far as we are concerned, as sanitary inspectors, is a measure fraught with grave significance by the wide reaching effects it may have upon our statutory work.

Does this mean anything? if so, it means that a sanitary inspector's duties are to be widened, his responsibilities increased and his tenure of office, whilst acting legally, safeguarded, by the removal of powers invested in county boroughs to appoint and remove at their pleasure men entrusted

with the duty of drawing the attention of those who act on those bodies to their own and their friends' insanitary property.

The weakness of the powers entrusted to the Local Government Board Mr. George fully expounded, and in stating that the result of that weakness, in many cases, was that the public health law was practically a dead letter, because parties who are interested in insanitary property are dominant on local authorities, was well within the facts of the case; but one is not so sure that his remedy is the correct one, viz., the establishment of a further health authority, possessed of effective means of compelling local sanitary authorities to do their duty, though he is certainly following the line of communal rather than of individual action.

It is interesting, in this connection, to note that the Chancellor, in illustrating the work of the "new health authority" constituted under the Act, drew attention to the individual power of the police, who patrolled streets to see that property was protected, and if an offender eluded their vigilance he was pursued to the ends of the earth; but although he stated that he would treat the man who received rent, or ground rent, from insanitary dwellings which killed little children, as he would the receiver of stolen property, he does not propose to invest the sanitary inspector with a power similar to that possessed by the police, but to leave the question of "cleansing Britain of the foul habitations which breed consumption, disease or death in our great cities," to be fought out, or smoothed over by compromise by two health authorities, and thus again to render it easy to relegate to the background the recurring reports of an officer faithful to his trust.

In summarising, then, I will liken the great public health movement, which has developed in our country during my lifetime, to a plant whose seed, selected with great care by those who foresaw the need for its existence, was handed over to the gardener to plant and tend in the existing soil, and which seed has, by loving care, developed with such magnificence that the fame and success of the plant has attracted many, during its period of growth, to spend much time and thought upon its future, to advise in its management, to enjoy the comfort of its shade, to mourn over its defects, to gather its flowers, to partake of its fruits; whose roots have so spread that it now derives its nourishment from wider, more varying and changing soil, and under greater climatic variation, but of which plant greater strength, greater beauty, more shade, more fruit is continually expected.

Such a plant, virile as its seed must have been, required much care

to bring it to its great development; the preparation and manuring of the ground, the removal of parasitic growths, the pruning, the hundred and one little things the gardener has to know and do, must be done well if such success as this is to be the result.

You as sanitary inspectors must confer with one another on the many and widely-varied points which affect your charge, the public health, so that the magnificent monument of longer life and of lessened sickness which has crowned your efforts may be an incentive to you to work on, with that skill and assiduity which has characterised your individual work in the past, and without which the community you serve would have been the poorer in that greatest of all earthly blessings, health.

The Administration of the Canal Boats Acts, by Richard Allison, Inspector of Nuisances, Borough of Brighouse.

MANY sanitary inspectors are the appointed inspectors under the Canal Boats Acts, and I am informed that for more than twenty years at your annual discussions attention has not been directed towards the administration of these Acts.

History of Canals.

On the 17th July, 1761, the first canal constructed in this country was opened for traffic, and the great success attending this resulted in the construction of numerous other canals, until, at the end of the eighteenth century, practically the whole of the present canal system was completed.

The phenomenal success achieved by these private enterprises was due to the facts that railway systems did not exist, and that the roads were in such a condition as to be a menace to the safety of transit.

During the last fifty years, however, owing principally to the competition with the railroad systems, canal traffic has steadily declined.

In March, 1906, a Royal Commission was appointed to inquire into the present condition and financial position of the canals of the United Kingdom, and especially on the possibility of making better use of them for purposes of trade. It issued its final report in 1909. After a thorough examination of the inland navigation of the United Kingdom, and collateral study of continental systems, the Commission came to the conclusion that the advantages accruing to the commercial interests of the country from a good system of water communication would be very great. Such a system could only be created or recovered under present conditions by the intervention of the Government, and the Commission therefore recommended the appointment of a Waterway Board, to consist of from three to five paid commissioners, who should co-operate with the new Development Commissioners. The latter, in conjunction with the Treasury, would be responsible for the financial assistance to be given to the new Board; the Waterway Board itself would be chiefly occupied with administration and the framing of schemes to be submitted to Parliament. The report, signed by sixteen of the nineteen commissioners, recommended at the outset the acquisition of the Midland system of waterways, of which the Birmingham Canal is the centre, and the improvement of the connecting waterways with the Thames at Brentford, and with the Mersey, the Humber, and the Bristol Channel in other directions.

Statistics.

The total mileage of canals and navigations in the United Kingdom is 4,673½ miles, of which total about 3,639 miles lie in England, 183 in Scotland, and 843 in Ireland.

The capital invested in the present system is £47,550,000, the revenue being £2,680,000, and the expenditure £1,891,000.

The floating population is estimated at 35,000.

The number of registered canal boats is about 9,121.

The number of registration authorities is 121, and

The number of canal boat inspectors is 320.

History of Legislation.

Consequent upon an agitation against the abuses resulting from the introduction of the factory system, a Royal Commission was appointed in March, 1875, for the purpose of making inquiry into the Factory and Workshops Acts, with a view to their consolidation and amendment. In February, 1876, the Commission appointed made their report, in which the following passages occurred:—

> "The question, what can be done for improving the position of the canal population? was early brought to our notice, and requires to be considered separately. We have made it the subject of a special inquiry directed to the factory inspectors. So far as concerns factory regulations proper, that is, the limitation of the hours of labour, the women, young persons, and children who live in barges, and are fitfully employed in the work of conveyance along canals, must, we think, fall under the category of persons engaged in wandering occupations above noticed. We shall hereafter recur to this subject, in speaking of the education and sanitary provisions which it is desirable to enact with regard to this class of the population. There are three classes of canal boats: fly-boats, clean, well appointed boats, generally managed by three men; slow boats, worked by a man and his family; and coal, iron, and stone boats, worked by a man and his family. With respect to the first, no serious ground of complaint exists. They are the boats of the large companies. The other two classes of boats are most objectionable. The families live on board and have no settled habitation. Children are frequently born on board, possibly four or five or more sleep in the cabin, with about twenty-five cubic feet per person. The boats remain a longer or shorter time at the town of departure, spend more or less time in the journey, and remain a longer or shorter time for unloading, and for a fresh cargo at the town of arrival. There is no employment here of any kind analogous to that which would constitute a factory. Consequently, anything that could be done must be in the direction of sanitary and educational improvement . . . ."
>
> "It is necessary to recur once more to the subject of the canal population. We have seen that it is impossible to place them under the Factory Law, and that it is impossible also to secure education for the children, so long as the family continues to have no residence but a canal boat. Nothing short of a prohibition of the residence of children in the boats appears to us

adequate to the evil. Apart from the impossibility of the children obtaining education, there are mischiefs arising from the crowding together of whole families into a small cabin, and the withdrawal of the inmates from all religious and social influences, which appears to us sufficient to justify a strong measure. . . . . We recommend that the residence in canal boats of female young persons and of children above the age of three years should be forbidden. The operation of this law, we cannot doubt, will have the effect of withdrawing from migratory life the mother of the family, after the first year or two of married life; and will also rescue numbers of young girls from a very demoralising condition. It may be proper that this provision should be made by a special Act."

As a result of the report of the Royal Commission, a bill was introduced in the House of Commons on the 10th day of May, 1877, and received the Royal assent on the 14th day of August, 1877, with the title of an Act to provide for the Registration and Regulation of Canal Boats used as dwellings.

Clause 1 enacts that, after a certain time, no canal boat shall be used as a dwelling unless it has been registered.

2 directs that the Local Government Board shall make regulations for, amongst other things, the registration of the boats, for fixing the number, age, and sex of the dwellers therein, for promoting cleanliness, and for preventing the spread of infectious disease.

3 provides for the giving of certificates of registration.

4 empowers sanitary authorities to take such steps as may be necessary to prevent the spread of infectious disease.

5 gives to duly authorised persons the power of entry on board canal boats.

6 provides for the education of the children.

7 authorises the Local Government Board to prescribe which sanitary authorities shall be registration authorities.

10 provides a penalty for illegal detention of a certificate of registration.

12 provides that canal companies may establish schools for children in canal boats.

As directed by clause 2, two sets of regulations have been framed. The first set, dated 20th March, 1878, provides for the registration of canal boats, and sets out the conditions which must be fulfilled before they can be registered as dwellings, and other matters of a sanitary nature. The second set, dated the 17th May, 1878, declared which of the sanitary authorities of England and Wales shall be registration authorities for the purposes of the Act.

In 1884, "*An Act to amend the Canal Boats Act, 1877*" was passed.

Clause 1 provides that the certificate of registration is made void by structural alterations.

3 makes it incumbent upon all registration and sanitary authorities within whose district any canal is situate to enforce the Act and regulations, and to make an annual report to the Local Government Board.

5 gives power to make regulations as to school certificates, and attendance at school by children in canal boats.

6 requires an annual report by the Education Department.

7 amends section 3 of the Act of 1877 as to lettering, numbering, and marking of canal boats.

Section 9 defines the hours in which an inspector is empowered to enter; 10 amends the definition of canal boat.

Contraventions.

There are 18 contraventions which may be met with under the Canal Boats Acts and regulations, as following:—

1, Registration; 2, notification of change of master; 3, absence of certificate; 4, certificates not identifying the owner with the boat; 5, marking; 6, overcrowding; 7, partition separating the sexes; 8, females over 12 improperly occupying; 9, cabin not in a cleanly condition; 10, painting; 11, ventilation; 12, habitable condition; 13, removal of bilge water; 14, boats without pumps; 15, refusing to admit the inspectors; 16, provision of proper water vessels; 17, offensive cargoes, without requisite double bulkhead; 18, notification of infectious disease.

Administration.

It is obvious to anyone having practical knowledge of the Acts and regulations that there is need for revision of Nos. 1, 2, 5, 6 and 10 on the list. Dealing seriatim with these faulty regulations.

Registration.

1. This requires amendment. Section 14 of the Canal Boats Act, 1877, states:—

> "The expression, canal boat, means any vessel, however propelled, which is used *for the conveyance of goods* along a canal as above defined, and which is not a ship duly registered under the Merchant Shipping Act, 1854, and the Acts amending the same. This is amended by Section 10 of the Canal Boats Acts, 1884, as follows:—
>
> "If it shall, at any time, appear to the Local Government Board on the representation of any registration or sanitary authority, *or of any inspector appointed under this Act*, that the principal Act and this Act ought to apply to any vessel or class of vessels which would be within the definition of canal boat, contained in Section 14 of the principal Act, if such vessel or class of vessels were not registered under the Merchant Shipping Act, 1854, and the Acts amending the same, the Local Govern-

ment Board may declare that the principal Act and this Act shall apply to such vessel or class of vessels, although the same may be registered as aforesaid, and thereupon the same shall be deemed to be a canal boat or canal boats, within the meaning of the principal Act and this Act, and the definition contained in Section 14 of the principal Act shall be amended accordingly."

The amendment gives an important and necessary power to the Local Government Board, but I believe it is a power they are averse to enforce. In proof of this may I state one of my own experiences. During October of last year I had occasion to inspect a boat within the Borough of Brighouse, which from its construction and marking had every appearance of being a canal boat. The master produced a canal boat certificate, at the same time stating that the boat was registered under the Merchant Shipping Acts. The boat was marked in conformity with these Acts. I was afterwards informed by the Registrar of Shipping at Hull that the boat was registered as stated. I found the aft cabin in a disgraceful condition as regards cleanliness, and occupied by seven persons: husband, wife, and five children, the ages of the children ranging from nine months to seven years. The fore cabin was used as a store room. Taking advantage of section 10 I communicated with the Local Government Board, stating the facts, and soliciting the Board's intervention. The letter was formally acknowledged, but an inspection of the same boat some months later revealed similar conditions. It appears to me from observation and enquiry that many canal boat owners regard registration under the Merchant Shipping Acts as a comfortable harbour of escape from inspection by officers appointed under the Canal Boats Acts. Ample justification for this view is shown by paragraphs contained in the reports of H.M. Inspector of Canal Boats. The report for 1904-5 stated:—

"The increase in the number of canal boats registered under the Merchant Shipping Acts continues. Indeed, one authority reports that all its boats are now transferred, and the inspector can no longer visit and inspect any boat at all, The exemption of such boats from inspection causes much natural jealousy amongst dwellers of boats which are still registered under the Canal Boats Acts, and the prevention of this real evil is a very pressing question to consider."

The report for 1906-7 contains the following observation:—

"Our other serious trouble lies in the registration of canal boats registered under the Merchant Shipping Acts . . . . . . By Section 10 of the Act of 1884, the Local Government Board is given power to include such boats, whether registered under the Merchant Shipping Acts or not, and as this habit is a growing one (the habit of registering under the Merchant Shipping Acts), it would be wise to consider if the power should not be enforced. At any rate, no harm would be done if boats now registered under the Canal Boats Acts were by order prevented from escaping from them by registering under the Board of Trade."

Notification of Change of Master.

2. The experience of H.M. inspector, and most other inspectors, is that no useful purpose is served by the enforcement of this regulation.

Marking.

5. The marking of canal boats should be radically revised. When we are informed that a certain inspector of canal boats completed one hundred inspections in one year, with no contraventions, and admitted that in no single instance had he been on board a boat (*vide* H.M. Inspector's Annual Report, 1901-2), it must be acknowledged that some alteration is required. In this respect, I would suggest that the marking of the boat should be cut into the wood in the interior of the aft cabin.

The Board of Trade specify that their registration number shall be incised on the main beam of the boat. It appears to me that the present method of marking canal boats in order that the number may be seen from either side of the canal facilitates the compilation of figures at the expense of efficient inspection.

Overcrowding.

6. Many suspicious circumstances cannot be fully investigated because an inspector may not enter a boat later than 9 o'clock in the evening. It would be an advantage and serve a useful purpose if inspectors had power to enter both by day and night.

Painting.

10. Great difficulty is experienced in carrying out this excellent regulation. It is advisable that a register should be kept showing the date of last painting, similar to the registers used under the Factory and Workshops Act, 1901.

Repairing Boats.

Some difficulty is experienced in regard to the definition "canal boat." There is a class of boat termed "repairing boat," and several that have come under my notice are registered boats and produce certificates. The boats have, upon inspection, been found unsatisfactory. When, however, notice has been sent to the owners, it is alleged that they are repairing boats (although I have ascertained that they occasionally convey sand for building purposes from one district to another), and are exempt from inspection under the Canal Boats Acts.

A boat, the trade of which necessitates men sleeping upon it, should be amenable to the acts and regulations, and therefore the words "conveying goods along a canal" should be deleted from the definition of canal boat.

FORE CABINS.

The condition of the majority of fore cabins leads to the suspicion that, although they are registered for human habitation, they are generally used as lumber rooms only, the temptation being to overcrowd the aft cabin. It appears advisable that so long as the fore cabin of a boat is registered for sleeping accommodation, it should be maintained in conformity with the regulations.

CONCLUSION.

There are great possibilities in store for the canal traffic of this country, if properly conducted, and it would be of the utmost value to the inland industrial centres were the recommendations of the report of the Royal Commission, issued in 1906, adopted.

The inspection of canal boats is an important duty devolving upon local authorities. The canal boat population may easily be a source of the prolific spread of infectious disease, and it is only by assiduous inspection that this evil may be eliminated.

Reasons why Butchers should be Compensated on the Surrender of Tuberculous Carcases, by G. H. ANDERSON, Chief Sanitary Inspector, Middlesbrough (MEMBER).

I DESIRE to raise a discussion on the subject of compensation to butchers on the surrender of tuberculous carcases. It is not my intention to enter into the merits of the Order issued by the Local Government Board in 1899, but rather to consider how best to carry out its provisions without undue severity to any trade or community.

In towns where all animals are slaughtered in public abattoirs under direct control, it is not difficult to detect cases of tubercle, but where a large number of private slaughter-houses exist supervision becomes extremely difficult; and when butchers make a practice of calling in the inspector in all cases of doubt, it is only fair that when carcases are condemned they should not be called upon to suffer the whole of the loss.

In the town that I represent, during the last twelve months a large number of fine big, well-developed animals were discovered on being slaughtered, to be extensively diseased, and as in almost each instance the animal showed no sign of the disease when alive, it is unfortunate that the butcher should be heavily penalised. They were usually bought either in the public market or at auction sales, at prices ranging from £10 to £25, and even higher; and whilst it is possible that the farmer who sent the stock in for sale may have had his suspicions, the butcher who purchased the same at fair market prices cannot have had any.

In more than one instance the lungs and liver only were affected, and no trace of tuberculosis could be discovered on either the chest or abdominal cavities. Had an unscrupulous butcher hidden the lungs the carcase would undoubtedly have escaped detection. Again, a skilful slaughterman (given the opportunity) may so remove all evidence of disease that it would be extremely difficult to make a magistrate realise that the carcase was unfit for human food.

This state of affairs constitutes a great hardship, particularly upon the small butcher; and when the assistance of the inspector is called, and the carcase voluntarily surrendered as being unfit for human food, some compensation should be given. This principle has been recognised by successive Governments; in cases of pleuro-pneumonia, foot-and-mouth disease, swine fever, etc., compensation is always paid, and the time has arrived when tuberculosis should be added to the list.

The butchers have unsucessfully tried for years to obtain a warranty

clause inserted into the conditions of auction sales, etc., but the farmers refuse to accept any responsibility.

If the carcases are surrendered in the interests of public health, it is only reasonable that the public should contribute to the cost thereof, and not compel the butcher to bear the whole of the burden. In Middlesbrough a number of butchers have formed a Mutual Insurance Fund; they pay 10s. entrance fee, 1s. 6d. for each cow, and 1s. for each bullock slaughtered. They will not insure an animal that has cost less than £10. In the event of the carcase being condemned as being unfit for human food, two-thirds of the original cost is refunded to the butcher. The fees, however, do not cover the cost, and levies have to be imposed to make up the deficiency.

Again, some uniform method of procedure would be of the greatest advantage to inspectors. In many towns the methods of inspection are exceedingly good, whilst in others the opposite prevails. Whilst the Commission recommend that under certain conditions the carcase may be passed on removing the affected parts, many authorities condemn the whole. Uniformity of action is also needed when a carcase has been condemned. In many towns the butcher is allowed to strip the fat from the carcase and pour disinfectants or turpentine over the same and sell it for making tallow, whilst others go a step further and allow the whole of the carcase and offal to be sold for the same purpose. In other cases the whole carcase is destroyed once it has been condemned. There is no question that the latter is the proper course to pursue, for no matter what process is adopted, once the carcase leaves the slaughter-house, it is difficult for the inspector to learn what has become of it; it is also a great saving of time, for the inspector is bound to be present whilst the various precautions are being carried out.

If, say, two-thirds of the value of every animal purchased in the open market at a cost of £10 or more was allowed to the butcher for compensation, he would not then be so heavily handicapped as at present, nor would he object to the destruction of the carcase as expeditiously as possible when once it had been condemned.

MR. R. LAMBIE (Lanarkshire C.C.) was surprised that they should have had such a paper from a Chief Sanitary Inspector. How an official of a local authority could express such views puzzled him. It seemed to be a case of special pleading for one section of the community, and he thought that the duty of a local authority and its officials was to show no respect of persons or classes. Could anyone say why the community should pay compensation? He had

been trying for some time past to find one good reason, but he had not yet got it. The health of the community was threatened, and we were told that we could only protect it by paying compensation to a certain class. It was time that local authorities faced this question, and dealt with unsound meat in the same way as they would deal with other foods that were found to be unfit for human use.

Mr. A. E. Hudson (Cheltenham) contended that it would be a very unwise procedure to pay compensation to butchers for cattle which, on being slaughtered, proved to be tuberculous. The fact that a butcher occasionally bought a diseased animal in open market under the usual rules of an auction sale, which required the purchaser to take the risks of imperfections in the articles sold, was unfortunate for him, and in this connection the rules of auction seemed unjust, and to require alteration, because the feeder and seller of the animal had the better chance of being able to judge of its health, and should certainly share in any loss to the extent of at least one half. That the public should pay compensation to the butcher or farmer, or both, when meat which was prepared to be eaten was found to be unfit for that purpose, would be seen to be of doubtful expediency when carefully examined. It touched a large principle, namely, the responsibility of private ownership. If compensation be paid out of public money to the producer of bad meat, why not also to the producer of other food materials that had to be destroyed, bad fruit or bad potatoes for example. It was not difficult for butchers to assist themselves in this business by making an insurance against possible losses, and this would seem their proper course.

Mr. Anderson, in reply, said that he held no brief for butchers, but he pleaded for fair play, and he thought that the butchers were very unfairly treated in this matter.

It was because inspectors held such diverse opinions that it was very desirable to discuss the question in public with a view of arriving, if possible, at some solution of the difficulty. To compare a grocer purchasing bad eggs and other articles with the butcher was, to his mind, simply ridiculous. If any person purchased an article that was not of the nature, substance, and quality stated, or was mis-represented, he had his remedy in the Law Courts, but the butcher who purchased in the open market what appeared to be a sound and healthy beast, and found, on it being slaughtered, that it was extensively diseased, had no remedy whatever.

Surely, this was a grave injustice, and if tuberculosis was to be eradicated, and thereby the public health improved, some form of compensation should be given to those who worked in harmony with public health officers.

For those butchers always on the hunt for cheap stock he had no sympathy whatever, and this class should receive no benefit even though compensation were paid, for, they would remember, he fixed £10 as the minimum price, and stipulated that the beast should be purchased in the open market.

Inspection of Meat and other Foods, by J. C. Dawes, Chief Sanitary Inspector, Borough of Keighley (associate).

Abstract.

PROVIDENCE observes no law, and offers no protection. Commercialism, though honest, offers little more. The provision of a pure food supply is a problem which will not be solved either by providence or commerce, but by systematic and efficient inspection.

The work of food inspection is many sided. Local in administration it is, or should be, national in character. Its import to the individual is serious, to the populace, supreme. It bears directly on the question of physical degeneration, and certainly has an important moral aspect. It includes, in addition to the inspection of all food stuffs, the processes, surroundings, and methods of manufacture or preparation, and a knowledge of the law governing the sale.

The question for discussion is introduced under the headings: The Case for Inspection, The Present System of Inspection, and The Perfecting of Inspection.

The Case for Inspection.—Where complete inspection is in operation, it is found that unsound, adulterated or diseased conditions in our food supplies are not infrequent happenings, but the reverse. In the Borough of Keighley, by reason of a special clause in the slaughterhouse regulations, diseased meat is notifiable, and it can be shown that the meat supply of the district is, in consequence, quite equal to that of any other, and probably much above the average, and yet the inspector had to report as follows for the year 1911:—

> Total number of animals slaughtered for human food (all purchased at the highest market price), 6,500; number found to be more or less diseased, 107; number notified by the butchers, 78; number found on inspection, 29; number condemned as totally unfit, 26; number of carcases condemned in part, 18; number of organs (all edible), 378.

The standard of inspection is admitted by local meat traders to be reasonable, and the whole of the meat represented by the figures given, 13,446 lbs., was voluntarily surrendered. The amount represents the meat supply of 26,992 men for one day, or that of 73 men for a whole year, and all this in a town of less than 45,000 inhabitants. If this is true of an inspected area, what is happening where inspection is absent? No man, from a superficial examination of a live animal apparently in good condition, can say whether or not such animal is free from disease. Inspection, therefore, is necessary if the public health is to be protected in practice and not in theory only. Where inspection is absent protection also is absent, and

thousands of tons of food, totally unfitted for use, must be consumed by an unsuspecting public every year.

The Present System of Inspection.—This is a paradox, as it approximates much more nearly to one of extraordinary irregularity or even non-inspection. Standardisation is unheard of, uniformity of procedure or administration is uncomprehended, and qualifications for the work are grotesquely incongruous. We have the spectacle of differing local authorities viewing this matter as necessary, nebulous, and needless, and it follows that some must be wrong. Where the work is understood it is considered necessary, and where it is little thought of it is, of course, considered needless.

This fact gives rise to an awkward anomaly, as goods considered to be unfit for food in districts where the subject is best understood are considered to be fit in others. The traffic in uninspected meat should be rendered impossible, and one ventured to recommend the insertion in a local bill of a clause having for its object the prevention of such traffic, and the compulsory inspection of all meat sold within a district when slaughtered elsewhere; but the clause had a very short life and had to be withdrawn, which is a hardship on the people of a town who desire to have a satisfactory system of food inspection. At the present time the practice of food inspection must be admitted to be inconsistent, inadequate, and insufficient.

The Perfecting of Inspection.—The responsibility for efficient food inspection is divided amongst at least six authorities or persons, and if these could combine there is no doubt but that a uniform and practical system could be introduced. The authorities or persons referred to are as follows: The Legislature, The Local Government Board, The Local Authority, The Ratepayer, The Examining Bodies, and the Inspector.

The Legislature.—Excellent powers are already provided in the matter of food inspection, but experience has revealed the necessity for amendment, in order to prevent the transfer of uninspected food stuffs from district to district, and for power to stamp or otherwise mark inspected or approved goods.

The Local Government Board.—Seeing that the Local Government Board control thousands of appointments, it should be urged to recognise more fully the need for training and experience in so important a matter, and should be asked not to sanction appointments at impossible salaries, but to fix a minimum of, say, £130 per annum. The board should collect from each inspector annually a schedule of work done in connection with food inspection, and in return should supply him with returns for the whole country.

The Local Authority.—The local authority, being charged with the care of the public health, must take the responsibility when the charge is not fulfilled. It is to be regretted that the cheap official is in such demand, and that local influences are allowed to take precedence over experience. Districts are understaffed, and the public purse is saved at the greater expense of many private ones. It is wrong to place responsibility for neglect on the inspector appointed to discharge this duty along with others, at £70 per annum, less travelling expenses.

The Ratepayer.—Much responsibility attaches to the ratepayer, as it is he who elects the representatives to guard the public health. Unfortunately, he is too often satisfied with a guardianship that expresses itself in cheap officialism. To neglect so important a matter as efficient food inspection is to endanger the child-life of a district, and no ratepayer has the right to juggle with a child's chances of health. A higher authority should step in when the ratepayer fails in his duty, but not before. An educated public opinion is sorely needed, and there are few things which would educate it better than a revelation of the actual condition of things as they exist to-day, or, in other words, efficient inspection.

The Examining Bodies.—Too low a standard of qualification is at present set for this work. Training and actual experience are not appreciated as they should be. Men who have never held office, and have had no experience, may obtain the diploma. The Royal Sanitary Institute, the Veterinary Officers of Health, the Sanitary Inspectors' Association, and perhaps representatives of one or more of the northern Universities should combine to formulate a scheme in which the general public and the trades concerned could place their confidence.

The Inspector.—The unqualified inspector is not to blame for inefficiency if he has been appointed to perform duties for which he is incompetent. The work of food inspection is one requiring special training. The inspector must be expert in the art of diagnosis, and in the administration of the law. To acquire the necessary knowledge the inspector should be trained in an inspection department, and a premium should be placed upon such training by the local authorities and the Local Government Board.

With a sympathetic and generous local authority, efficient staffing of districts with fully qualified inspectors, power to stamp or mark inspected goods, and the prohibition of transfer of uninspected goods, uniform and universal inspection is practicable, and would be of priceless advantage to the public health.

The Evolution of the Health Visitor, by Mrs. Florence J. Greenwood, Sanitary Inspector, Finsbury (late Chief Woman Inspector, Sheffield) (Associate).

THE arousing of public opinion on the question of infant mortality, and the passing of the Notification of Births Act, has brought into great prominence the work of the health visitor.

Much confusion of thought and ignorance exists in the public mind as to the position she occupies and the scope of her duties. There is a very general impression abroad that this work is an entirely new departure, and many people are unaware that unofficial and official health visiting has been going on, unostentatiously, for many years in various parts of the country.

In 1861, the first Public Health Society was formed by a few ladies, who resolved to "teach the women of Manchester and Salford how to keep themselves, their children and their home clean and healthy." At first tracts on health subjects were distributed, but these were soon supplemented by the appointment as visitor of a woman, who had received some training to fit her for the post.

The number of visitors soon increased. They were superior working class women with a salary of 14s. per week. In 1899 some of their salaries were paid by the public sanitary authority of Manchester, but the work continued to be done under the auspices of the Public Health Society.

In March, 1908, the health visitors were taken over by the corporation, in 1910 their numbers had risen to sixteen; eight were certificated women, the other eight being taken over from the Ladies' Public Health Society.

Glasgow was the first county borough to introduce women officials into the public health service. As early as May 16th, 1870, four female visitors were appointed in connection with the Public Health Department. They were afterwards called assistant sanitary inspectors, and they possessed the same right of entry to premises and houses as the men inspectors, and were required to hold the certificate of the Incorporated Sanitary Association of Scotland. Their duties were, "by persuasion principally, to induce the women householders to keep the interiors of their dwellings in a clean and sanitary condition, and to advise them generally how this can best be maintained." They reported certain nuisances, but dealt with others themselves, such as "dirty homes or dirty beddings, clothing, and furnishing."

Their salaries ranged from 20s. to 30s. per week. They are now employed in visiting under the Notification of Births Act.

In 1892 the first woman inspector of workshops was appointed in Nottingham, this was followed in Manchester by the appointment of two women inspectors of workshops. In 1893 a woman inspector was appointed in St. Helen's to visit from house to house in the poorer parts of the town, with a view to *giving advice to mothers as to the* feeding and care of infants and young children, domestic hygiene, and the detection of nuisances. This was followed by the appointment of women inspectors in Liverpool, Leeds, Sheffield, Bradford, and other places.

All these women were engaged primarily in house to house visitation, the giving of advice with regard to infants and young children being as important a part of their duties as the detection of nuisances, many of which they dealt with themselves, others they noted and reported to the district inspectors; but they were all certificated and appointed as inspectors, or assistant inspectors of nuisances.

In 1899 the same kind of work was begun in Birmingham by Dr. Alfred Hill, who, however, objected to the term Inspector as applied to women, an objection which is shared to-day by his son, Dr. Bostock Hill, and, therefore, the women officials in Birmingham were known and continue to be known as health visitors. Other places followed the example of Birmingham.

Having regard to the fact that the term "Health Visitor" was originally used by a class of women of inferior education and standing, and that the appointment placed the women as health officials on a lower status, it was felt by many that it lowered the standard of the Public Health Service.

It will thus be seen that there were two distinct opinions on this matter, which led to the appointment of women outside London performing practically the same duties, but with the differing titles of sanitary inspector and health visitor, according to the individual opinions of the medical officers in the various boroughs.

With the exception of Nottingham, Leicester, and Manchester, the inspection of workshops in the provinces by women was a somewhat later development: the work for which women inspectors were primarily appointed was health visiting.

The work of women officials in the county and municipal boroughs is now highly organised, and there are already between two hundred and three hundred health visitors, besides about a hundred women sanitary

inspectors throughout the country, carrying out the provisions of the Notification of Births Act.

In view of these facts it is difficult to understand why a Health Visitors (Public Health) Bill was introduced by Mr. John Burns into the House of Commons, which purported to give power to local authorities outside London to appoint health visitors under the Notification of Births Act. It is to be hoped that this measure, which was most reactionary in character, requiring absolutely no qualifications for the position, is dead beyond the hope of revival.

No account of the evolution of the health visitor would be complete without mention of Miss Nightingale's scheme to carry health into the home in rural districts. The standard she raised and the ideal she had in view was higher than that with which the work had been begun in Manchester and Scotland. Her idea was to train educated women "in such a way that they could personally bring their knowledge home to the cottagers' wives on a mission of health for rural districts."

In her letter to Mr. Frederick Verney written October 17th, 1891, she said, "We have . . . . . . excellent town district nurses, but for many obvious reasons they would not be quite suitable for your proposed work . . . . We have arrived at the conclusion, that to make the movement a success, we must find some gentleman apt to teach, and educated women apt to learn, in other words we must train them for the purpose and we must not mix up nursing the sick with health in the home."

She emphasised the necessity of teaching practical domestic sanitation to the mothers and girls, and said what was wanted was a school of health. "It seems hardly necessary to contrast sick nursing with this. The needs of home health-bringing require different but not lower qualifications, and are more varied. They require tact and judgment unlimited . . . . and real belief in sanitation."*

She induced Dr. De'Ath, one of the North Bucks Medical Officers of Health, to undertake the training of twelve ladies, who afterwards went through an examination, and did excellent work, lecturing to the village mothers, and visiting them in their homes. The care and feeding of infants was only one of the subjects taught.

This valuable scheme of Miss Nightingale's had an undoubted influence in inducing many educated women to take up health work; and the course of training instituted by the National Health Society gave them the opportunity of acquiring the requisite knowledge.

---

* Letters from Miss Nightingale on health visiting in rural districts.

The work of women officials in the public health service in London developed on somewhat different lines from that in the provinces.

The Factory and Workshops Act of 1891 led, in 1893, to the appointment in Kensington of two women inspectors of workshops; but it was not until 1895 that a woman inspector was appointed in Islington with the legal status of sanitary inspector.

In 1901, eleven women had been appointed in the metropolitan area, nearly all of whom were exclusively engaged in the inspection of workshops. There are to-day between forty and fifty women sanitary inspectors in London, with very varying duties.

As medical officers and the general public became more and more interested in infant mortality, the women officials were made use of to investigate infant deaths, to visit houses where a birth had taken place and advise mothers on infant care, to manage milk depots, to weigh babies, to assist at infant consultations, and to do a great deal of work which had hitherto not been regarded as the work of a sanitary inspector.

There was never any question as to value of the work done, or the efficiency with which it was performed, but the Local Government Board auditor took the view that it did not come within the sanitary inspector's order of 1891, and refused to sanction the payment out of the county rate of half the salary of those women who were engaged in health visiting work.

In March 1905 Kensington solved the difficulty for itself by appointing a health visitor, paying the whole of her salary out of the local rate, but less wealthy boroughs felt unable to do this.

It was work which the sanitary authorities wanted to do, it was work that the L.C.C. and the L.G.B. were desirous of seeing performed, but this technical difficulty stood in the way. It was overcome by the inclusion in the L.C.C. General Powers of 1908, of Section 6, empowering sanitary authorities in the metropolitan area to appoint health visitors, and enables the L.C.C. to contribute half their salaries out of the exchequer account.

QUALIFICATIONS, ETC., OF HEALTH VISITORS IN LONDON.

In September, 1909, the Local Government Board issued an order under Sec. 6 of the London County Council (General Powers) Act, 1908, making regulations with regard to health visitors appointed in London, as follows:—

Art. 1.—Qualifications. A woman shall be qualified to be appointed a health visitor if she (*a*) is a duly qualified medical practitioner; or (*b*)

is a duly qualified nurse with three years' training in a hospital or infirmary, being a training school for nurses and having a resident physician or surgeon; or (*c*) is certified under the Midwives Act, 1902; or (*d*) has had six months' nursing experience in a hospital receiving children as well as adults, and holds the certificate of The Royal Sanitary Institute for Health Visitors and School Nurses, or the Diploma of the National Health Society; or (*e*) has discharged duties similar to those prescribed in the regulations in the services of a sanitary authority and produces such evidence as suffices to prove her competency; or (*f*) has a competent knowledge and experience of the theory and practice of nurture, and the care and management of young children, of attendance on women in and immediately after childbirth, and of nursing attendance in cases of sickness or other mental and bodily infirmity.

Art. 2.—Every appointment must be confirmed by the Board.

Art. 6.—Tenure of office. Enables a sanitary authority to determine the appointment of a health visitor by giving her three months' notice, and no woman may be appointed unless she agrees to give three months' notice previous to resigning the office or to forfeit a sum to be agreed.

Art. 8.—Outlines the duties of the health visitor, but prohibits her from discharging duties pertaining to the position of a sanitary inspector (*unless*, with the consent of the Board, *she holds the dual appointment* under Art. 12).

Art. 9.—The Board's approval is required to the salary to be paid to the health visitor, and an allowance in respect of clothing, where uniform or other distinctive dress is required, may be made.

The Board, in their circular letter, state that they consider that having regard to the important duties to be discharged by the health visitors and to the salaries paid to women sanitary inspectors in London, the salary should be not less than £100.

Side by side with the appointment and work of women health officials a large army of more or less voluntary workers has sprung up, consisting of paid and unpaid workers in connection with health societies, maternity nursing associations, leagues of service, public welfare associations, guilds of help, and other organizations, all of them more or less efficient and enthusiastic.

It will be seen that an entirely new official in London was created by this order, and many women were appointed under it with no sanitary knowledge and no acquaintance with the Public Health Acts.

1. What has been the effect of this departure, on the public health service?

2. Does it simplify or complicate public health administration?

3. Is it making for economy and efficiency?

The immediate effect was for boroughs (where there had not been any women officials) to appoint health visitors.

Some boroughs which possessed women sanitary inspectors appointed also health visitors.

Seven or eight boroughs reappointed their women officials in the dual capacity of sanitary inspectors and health visitors, so that the work in these places went on in exactly the same way as it had before. An indirect effect has been the almost complete cessation of the appointment of women sanitary inspectors and the diminution in their numbers in some boroughs by the lapsing of several appointments. The inspectors of workshops for which they were first appointed lapsing into the hands of men.

In one London borough with which I am well acquainted there are at the present moment to be found a woman sanitary inspector, two official health visitors, a paid phthisis worker for a voluntary organisation, and numerous voluntary health workers.

As health visiting in this district was begun by a woman sanitary inspector, all these people are called "sanitary ladies" and are supposed to come from the "Town Hall."

This is a distinct advantage to the voluntary worker, but is not an unmixed blessing to the Public Health Department or to other officials in the borough.

The fact that there are in London two administrative bodies adds to the difficulty, and the two following cases give some idea of the overlapping and confusion which exists.

A poor woman was attended in her confinement by a midwife, who duly notified the birth to the local supervising authority. The baby developed inflammation of the eyes and the fact was reported to the local supervising authority, *i.e.*, the London County Council. The midwives' inspector visited and reported the case to the medical officer of health, adding that it was one of extreme destitution. The medical officer of health reported it to the relieving officer and sent the woman inspector to investigate the opthalmia neonatorum. In due course, the health visitor called to see the baby; a voluntary visitor, who had been visiting more or less throughout, reported to the health department that the room was over-crowded and the district inspector went down and met the woman inspector on the doorstep.

Some one else reported the case to the N.S.P.C.C. and the "cruelty man" visited, so that seven officials visited within a few days. Eventually

the baby died. It only needed one of the children to be consumptive for the phthisis visitor also to have appeared on the scene.

In another borough, where there are two women sanitary inspectors and two official health visitors, one woman sanitary inspector visits phthisis cases, the other visits home-workers, and the health visitor births; so that if a baby makes its appearance in the home of an outworker, and a member of the family is phthisical, the home may be visited by three or perhaps four officials.

One cannot help wondering why, when the work was done in a satisfactory way by the woman sanitary officer, the Sanitary Inspectors Order of 1891 could not have been amended, so as to include the modern developments of the public health service, and so allow the half of her salary to be paid out of the county rate. There is no doubt that prejudice in favour of the title of health visitor had a great deal to do with the matter, not among the poor, nor amongst officials, but with the philanthropic and social worker who has little experience in the matter.

Much has been written and said as to what a health visitor should or should not be. Miss Nightingale wrote: "The necessary stock-in-trade of anyone who wants to be a health visitor is therefore some knowledge and much sympathy." It is stated in a pamphlet issued by the National League for Physical Education and Improvement that health visitors must be thoroughly tactful; again, they are to help the mother, "not to find fault with her."

At a recent conference on the question of infant mortality, Sir Thomas Barlow said the health visitor is not to be regarded as a policeman or a sanitary inspector. Upon consideration I think it will be agreed that health visitors do not possess a monopoly in tact and sympathy, that these latter qualities cannot be put on or taken off with a name and a uniform, that inspectors, both men and women, if they are to do good work, must also possess tact and sympathy. How is it that health visiting in the past has been successfully accomplished by women sanitary inspectors, and what about the women who are appointed in the dual capacity of sanitary inspector and health visitor? Are they for three days in the week to be regarded as policemen who have come to find fault, and as health visitors with tact and sympathy during the other three, or how are these conflicting qualities to be combined?

The difficulty is a sentimental one, and exists only in the mind. The experience of women who have been engaged in the work for many years has brought out of the following facts:

1. That the term Inspector is an advantage rather than a drawback.

2. That the right of entry has been of great value in cases where neglect, drunkenness and domestic insanitation obtain.

3. That the powers of an inspector are of infinite advantage in enabling her to speak with authority and if necessary to enforce compliance on the part of tenant and landlord with the requirements of Public Health Acts.

4. It enables one official to deal with the various conditions affecting home life, and thus obviates a multiplicity of visits and overlapping.

5. The more thorough knowledge obtained by repeated visits to one home for various purposes such as the visiting a birth, the inspection of a homeworker's premises, the investigation of a case of phthisis, overcrowding and the like, is most valuable in helping one to deal with the conditions found.

6. A variety of work is also very desirable for the worker, and to be able to switch off occasionally from babies to outworkers and from outworkers to phthisis, keeps one fresh and relieves monotony.

My contention is firstly that the present position especially in London is chaotic and anomalous, and secondly that it makes neither for efficiency nor economy and tends to complicate Public Health administration and to lower it in the public estimation.

Dr. Bostock Hill in a letter to the British Medical Journal last year said the old idea of sanitary work as being chiefly associated with plumbing and drain-pipes was fast passing away, and that the true meaning of hygienic effort was beginning to be understood. Many men inspectors are to-day visiting phthisis cases, are investigating cases of puerperal fever and other conditions in which tact and sympathy are absolutely essential and on their behalf as well as my own I must repudiate the idea that we are invariably looked on as a kind of police and that our function is one to find fault. If the term inspector is an opprobrious one, and he or she must necessarily be regarded as a bugbear, then the sooner it is done away with and some other title found, the better.

Is it not time—

1. That the Public Health Acts were consolidated and brought up-to-date.

2. That the Local Government Board Orders under which the position and duties of sanitary officials are defined should be expanded so as to include the recent developments in public health work in regard to the notification of births, phthisis, and non-notifiable and infectious diseases.

3. That all officials in the public health service should be entitled health officers, thus doing away with the varying terms inspectors of nuisances, sanitary inspectors, and health visitors, leaving the latter title to voluntary workers.

4. That there should be an amendment of the course of instruction and examination of sanitary inspectors, which should include—

(*a*) A preliminary examination in sanitary science, the passing of which should be obligatory on every man and woman who desires to enter the public health service, either in London or the provinces.

(*b*) A series of second examinations which should be optional and open to both men and women on personal hygiene, care of infants and young children, prevention of consumption, house construction and plumbing, meat inspection, dairies, cowsheds and slaughter-houses, and so forth.

This is a very rough outline of a scheme which would require careful consideration, but it might solve some of the difficulties involved in the present position, and it will serve as a basis for discussion.

An article which appeared in the *Sanitary Record* some time ago contained the following remark:—

> "Some of us in days gone by have held strong opinions as to the fitness of women for sanitary inspectors. But the objections have long been over-ruled, and the woman inspector has long been an accomplished fact. It has also been proved, time after time, that she has proved herself capable of carrying out her duties. She can sometimes obtain an entrance into places to which men would experience the utmost difficulty; and the reports she brings into the office often make the task of the male inspector easy of accomplishment. Her technical knowledge has many times proved advantageous, and without it her efficiency would be considerably lessened. It may be true that the 'old idea of sanitary work as being chiefly associated with plumbing and drain-pipes is fast passing away,' but they play a very important part in domestic sanitation, and the time has not yet arrived when we can weaken any part of the training of those to whom is committed the administration of our health laws."

I desire that the evolution of the health visitor should go a step further, and believe it will make for efficiency, simplicity and economy for her to hold a sanitary certificate, and to became an *administrative* as well as an *advisory* officer, and for there to be one class of women officers in the public health service.

Decision of Council on Resolution passed at the York Congress, 1912.

Resolution passed in Section E., Industrial Hygiene, on paper on "The Progress of Sanitary Legislation in Industrial Occupations," by Miss A. J. Safford (see Vol. XXXIII., p. 515).

> "That this Congress approves the principle of the Factory and Workshops Bill dealing with underground workplaces, and recommends the Council of the Institute to urge that it be passed into law without delay, and to send copies of the resolution to Lord Salisbury and Mr. McKenna."

A copy of this resolution was sent to the Marquis of Salisbury, the Home Secretary, and other members of Parliament interested in the Bill. A petition in favour of the Bill was sent in to Parliament earlier in the year.

Town Planning in relation to the Development of the South Yorkshire Coalfield, by ARTHUR B. DUNNE, B.A., M.B., B.C.Camb., D.P.H.Lond., Medical Officer of Health, Doncaster Rural and Bentley Urban Districts (MEMBER).

Read at Sessional Meeting, Doncaster, November 23rd, 1912.

THE subject chosen for discussion is one which has been before the public in this locality more especially since January 16th, 1911, when the Mayor of Doncaster presided over a large and representative gathering convened to promote a scheme for the Town Planning of this district. At that meeting the Archbishop of York made a weighty contribution in a speech on the subject.

The special problems of public welfare, which the concentration of the new population involves, are receiving effective consideration by those bodies especially created to deal with them; and in this connection I would refer to the work which is being done to provide opportunities of public worship by the Committee on which the late Mr. Pickering, H.M. Inspector of Mines, was so active a member.

I refer briefly to the geological aspects of the South Yorkshire Coalfield, as they supply the key to the right understanding of the difficulties and special characteristics of its development as affecting Town Planning.

It is common knowledge that the coalfield of South Yorkshire extends at least 15 miles east of Doncaster, and that throughout this area the famous seam of coal known as the Barnsley Bed has been reached at depths of from 595 to 1,062 yards.

Until seven years ago the easterly boundary of the Yorkshire coalfield which was being worked could be roughly indicated by a line, running north and south, along the range of limestone hills through which the river Don has cut its way at Conisbro.

In the district around Doncaster 13 new collieries are in process of being, or are about to be, sunk. Of these, 10 are within the area covered by the Rural District Council of Doncaster and the Urban District of Bentley.

The Barnsley seam, as it extends eastward, dips further and further away from the surface of the earth, so that very large and deep shafts are required to be sunk to work it. Large areas of minerals have also to be leased. For these and other reasons a colliery undertaking has to face

from the first a very heavy capital expenditure. The work, therefore, of sinking and developing the colliery, when once begun, is carried forward night and day. Only a few hundreds of men are employed at this stage in sinking the shaft, making the sidings, and erecting the permanent buildings and machinery. These men are housed in temporary wooden huts, and they form a community to themselves. It is only when coal has been reached and the pit has been opened up that large numbers of colliers will be employed. For instance, I am informed that in one of the largest of these pits 4,000 underground workers will ultimately be employed. It is estimated that each pit will form the centre of a district of from 10,000 to 12,000 persons, and that in the districts surrounding Doncaster in the near future there will be a population of 120,000 directly dependent upon mining. As the collieries are situated in sparsely populated rural parishes, and are sometimes quite a distance from any existing village, it will be realised what are the problems involved in housing these people.

No review of the subject of town planning would be complete without referring here to the provision for their workpeople which the colliery companies have themselves made, and are making, on a large scale.

The pioneers, so far as this district is concerned, were the Brodsworth Main Colliery Company, whose chairman, Sir Arthur Markham, Bart., M.P., has taken a warm interest in providing better homes for the colliers.

This company erected, in 1907, on an estate at Woodlands, a model village, which was honoured with a visit from their Majesties the King and Queen during their Yorkshire tour.

As an excursion has been arranged which will include a call at this village, I shall but briefly describe its chief features.

It is situated in the parish of Adwick-le-Street, one mile south-west of the ancient village. The parish had a population of 307 in 1901, which had increased to 5,731 in 1911. Woodlands itself, with a population of 3,181, is built on a limestone plateau 150 feet above sea level, and is reached by the Great North Road from Doncaster, four and a half miles away.

The situation is healthy and the air bracing, and thus it enjoys a great advantage in this respect. Its roads and avenues have been laid out on a generous scale, while there are spacious open greens at the rear of the houses. For purposes of description I may say the village consists of two portions, the earlier of which was erected in June, 1907. Here there are 118 houses, built around a large open green twelve acres in extent: this park, which is surrounded by houses embowered in fine old trees which have been carefully preserved, forms the most striking and beautiful

feature of the place. The houses in this part of the village number five to the acre. The mansion house which belongs to the estate has now been adapted to the purpose of a workmen's club.

The main portion of the village lies to the north of the park, and consists of 530 houses erected on what was formerly agricultural land. The main feature of the plan of the village is a wide crescent with connecting and radiating streets. The houses are built in short rows, and the cottages themselves have tiled roofs, casement windows, and pebble-dash walls. In this part of the village the houses number eight to the acre, and the rents of the houses range from 5s. 3d. to 6s. 6d. per week, clear of rates.

There are three types of houses, varying in respect of the accommodation provided:—

1. Three bedrooms, large living-room, scullery, and larder. Rent 5s. 3d.
2. Three bedrooms, living-room, parlour, larder, scullery, and bath. Rent 6s. 3d.
3. Three bedrooms, bathroom (hot and cold water), living-room, parlour, and scullery. Rent 6s. 6d.

The company have laid on water to the houses and have provided a water-closet and sanitary ash-bin for each. The sewage from the village is treated at the sewage outfall works a mile away. The contour of the land facilitates drainage, and no pumping is necessary.

The scavenging of the village is undertaken by the company, who employ a staff of men for this purpose. Spaces have been reserved for the erection of public buildings, and the West Riding Education Committee has erected a large modern school to accommodate 910 children. Various religious denominations have places of worship, and a large church is in course of erection.

While Woodlands has not escaped criticism for various reasons, against this must be set the fact that, as one of the model types of colliery villages, it has attracted attention and stimulated public opinion on this important matter of housing the colliery population.

I would also refer to the provision which other colliery companies have made for their workmen in the district.

Messrs. Barber and Walker have a colliery village, covering an area of 75 acres, at Bentley, where 802 houses will eventually be erected.

At Edlington, in connection with the Yorkshire Main Colliery Company, a large estate has been laid out to provide 823 houses.

At Askern the colliery company has bought an estate, and intends to erect 1,000 houses.

DIAGRAM SHOWING THE BOUNDARIES OF THE RURAL DISTRICT OF DONCASTER.

The Urban Districts of Bentley-with-Arksey, Balby-with-Hexthorpe, Bolton-on-Dearne, Thurnscoe, Mexborough, Tickhill, Wheatley, and the Borough of Doncaster.

At Rossington, where the Sheepbridge Coal and Iron Company are engaged in sinking a new colliery, there is to be erected a colliery village of 849 houses, laid out on the same principle as in their well-known village at Maltby.

At Owston the Bulcroft Colliery Company are erecting a small village.

All the above villages, though differing one from another in design, yet have this in common, that they are laid out on a definite plan from the beginning, the houses being erected as they are wanted. A water supply is provided to each house, water-closets take the place of the privy-midden, and the long, monotonous rows of colliery houses which begin anywhere and end nowhere, and of which numerous examples are to be seen in the older parts of the Yorkshire Coalfield, have no place amongst them.

These villages owe their existence to the colliery companies, and must form the nucleus around which any town plan may be drawn.

They will not, however, be capable of housing the new population altogether; the speculative builder is already in the field providing houses to fill up this deficiency, and it is in connection with the activities of the private builder that the necessity of a town plan for a colliery village arises.

The subject of town planning is now again engaging the attention of the local authorities, and a joint meeting was held last month at Doncaster. As reported in the press, directions have been given to the surveyors of the respective districts to meet in November. During the year a joint town planning scheme, in which the urban districts of Bolton-on-Dearne, Wath, Mexbro, and the rural district of Doncaster participated, has for some time occupied their attention. The scheme, in addition to its ultimate purpose, is a useful means of familiarizing those concerned with the procedure involved in town planning.

The Doncaster Rural District Council, within whose area the greater part of this colliery development is taking place, has appointed a town planning committee, has decided to commence work, and has directed their surveyor to map out an area at Askern.

From the Press I gather that a town plan for Maltby in the Rotherham Rural District is being considered.

Such then is a brief sketch of the present situation in the South Yorkshire Coalfield as to the colliery development, the provision of colliery villages, and of the action taken by the local authorities under the powers conferred upon them by the Housing, Town Planning, etc., Act, 1909.

Public opinion, in this district, as evidenced by the action taken by the

local authorities, is now alive to the necessity of town planning before the opportunity has gone by.

To quote the eloquent words of the Archbishop of York in his inaugural address to The Royal Sanitary Institute Congress at York on July 29th last, what is desired is "Industrial towns planned with forethought, built with care, and filled with the life-giving spirit of health."

DR. JAMES R. KAYE (West Riding C.C.) said, in discussing this matter they must bear in mind that there were three aspects of it: (1) the condemnation of unhealthy houses; (2) the provision of new ones; and (3) town planning, and so they had those three subjects dealt with in the Act.

He had read much of the voluminous literature published broadcast on this subject, but the Doncaster problem was scarcely touched upon. It was not a case of repairing or re-arranging the suburbs or clearing out slums, nor was it in the vicinity of a town where the movements of a population were more or less obvious. The Doncaster problem was unique, and referred to virgin areas devoid of houses, and the question was, how were they to limit the haphazard erection of dwellings to meet the admission of an industry suddenly arising in the locality? It was true, as Dr. Dunne had told them, that colliery owners had formed a nucleus in some instances, and had built houses upon modern lines on a definite plan.

This was a question that must be considered from various points of view. Take the position of the local authority, who were not yet satisfied that the movements for the provision of State-aided houses were on business lines; their cry was, unless they scheduled the whole of the country side, speculative builders could build outside governing areas, so that the land and scheme involved might be laid out, and no houses built thereon. The rural district councils also feared an increased burden on the rates. It must be admitted that the proper housing of the very poor seemed practically impossible, except some public burden was borne, and they were to bear in mind that good housing meant diminishing public expenditure in other directions. Take the ratepayer, and the reply was, he had enough to do to pay his own rates. Take the builder, investor, and landowner, and it was still a question of £ s. d. Of course unwilling helpers and tenants pointed to the insanitary habits of the incoming tenants, and the damage that often followed their occupancy of even new property. It would therefore appear that individuals could not involve, and local authorities refrained from involving, themselves in what they regarded as an unprofitable concern. In Ireland within recent years something like £559,000 had been advanced by the State; why not something of the kind in England on the same principle? It was to be hoped that the Rural Cottage Bill, which was intended to secure, by

way of loan, three-bedroomed cottages and an eighth of an acre of land, would very soon be placed on the Statute books. The difficulty was where to draw the line, and what would the effect be on the tenants. Some regarded this State spoon-feeding as harmful and savouring of charity.

Unfortunately, the Act of 1909, admirable though it was, did not overcome the difficulty of keeping pace with the progress demanded in the erection of houses in new colliery villages. The spirit of the Act was co-operation, and that involved an immense amount of labour, such as the permission to repair, the adoption and sanction by the local authority of plans, and submission to the Local Government Board. In fact, it was stated in the Memorandum of the Local Government Board, that some two to three years were necessary for the complete approval of a scheme under the Housing and Town Planning Act.

It was interesting to note that since 1851 no less than a dozen Housing Acts had been passed into law. and still they heard the voice of the housing reformer crying more loudly for something in the way of practical results.

In the Riding five urban sanitary authorities had put in force housing schemes during 1912, but it was discouraging to know that not a single application had been made amongst the thirty rural district councils. They wanted bold disinterested members; men who, instead of blinking and winking, would be frank and fearless in their encouragement of officers to carry out a difficult and even unpleasant and thankless duty.

MR. F. KIRKBY (Chairman, Bentley U.D.C.) said town planning meant the avoiding of mistakes made hitherto by allowing houses to be erected anywhere and anyhow. They wanted the houses for the workers in the colliery districts to be made as pleasant as they could be. The problems involved in housing the people were many, but they must, and could, be overcome, and town planning and housing must go together. A place where a person ate and slept must be made so that health should be promoted and not impaired. There were opportunities for the jerry builder to rush up some of the most indescribable rubbish. They might have a town plan yet get bad houses erected after all their trouble if the buildings were not supervised as they were built. In certain districts of this area hundreds of houses had been built, and some of them were almost ready to be condemned. When a colliery commenced sinking, the parish council ought to have authority to appoint a surveyor and nuisance inspector. It would be a great advantage to the district if these appointments were made. Houses would not then be built of bad bricks and rotten timber, and bad drains would not be found if the officers appointed did their duty. It might be said this could not be afforded, but it would be the cheapest way in the end. Money could not be more necessarily and justifiably spent. They had known what it was to have bad scavenging or none at all, bad footpaths and no drains, so that one could hardly think he was living under any authority at all, except that the rate collector called occasionally. This was largely because the area could not be managed by

the elected councils. It was the duty of everyone who desired the health of the people in these new areas to press for the appointment of such officials as he had indicated.

Dr. G. J. Langley (Doncaster), approaching the question from the practitioners' point of view, said he was enormously impressed, in the course of his work, with the tremendous difficulty of getting people well when they were in bad surroundings. There was an economic loss to the nation every time a worker was ill, and the longer he was ill the greater that loss. The great battle against consumption would be very much handicapped unless great efforts were made to ensure that the patients, after they had received treatment, could return to homes where they had some decent chance of retaining their improvement. With regard to the planning of colliery villages, Dr. Langley said at the Woodlands the miners had been provided with a front and back garden, but owing to the fact that they had neglected to keep them in anything like decent repair the place had a somewhat dilapidated appearance, particularly at this time of the year. If they visited the model village at Bolsover they would find it had a derelict and uncomfortable appearance because the cottages had no gardens at all, but only asphalted backs and fronts. He suggested that they should combine the two methods, and arrange that some houses should have a nice piece of garden and others asphalted backs and fronts, and that those with gardens should be let to people who would take an interest in them.

The Rev. T. Forster Rolfe (Rector of Kirk Bramwith) said there were few places in the South Yorkshire Coalfield where they would have the advantages Sir Arthur Markham had in laying out the Woodlands, namely, on a plateau. The other pits were toward the flat country, and there would be all the more need for town planning. In the case of Askern, they had the choice either of going on the hill or down on the flat, and as far as he could see at present those who wished to build were more or less shut off from the hill. Years ago, when it was a little spa, it would have spread very much quicker if the hill had been open to be built upon. The question for the Rural District Council was whether they had power to see that building went in the right direction. Following its own line it was going on the flat and stretching towards the sewage works. Carcroft and Bullcroft would be the same. Could there not be some combined action between the Borough and the Rural District Council? Would they not both be concerned in the question of drainage? Those who knew the neighbourhood knew that the drainage would be a very important thing because of the sinking that would take place owing to the mines. Were they to take all the drainage in one direction? If that was so, there was no reason why the Corporation should not join with the Rural District Council. Did they not, he asked, in the well-off classes, think a great deal of

the surroundings of their children in the nursery? If they thought it would not make much difference to the collier of this generation what village he lived in, were they sure it would not make a great difference to the rising generation? The great thing was that they wanted the air space. Town planning did not affect the housing if the authorities did their duty. If they did not take up town planning soon the speculator would step in. He knew of land sold for £120 an acre to a company, but when the Local Education Authority wished to put up a building for public purposes they were asked £1,000 per acre.

MR. R. G. WHITLEY (Surveyor, Bentley-with-Arksey U.D.C.) said there had been much discussion on town planning, but the actual work done in the South Yorkshire Coalfield was disappointing.

If that meeting were to grasp the possibilities of the district, and the authorities concerned were to take it to heart, they would have a town plan within the next twelve months. It had been said provision would be needed for 100,000 people. That would mean they would require 20,000 more houses. If they allowed ten houses to the acre, 2,000 acres would be required. The need of the district was urgent, and the procedure of the Town Planning Act would hardly meet the case. The procedure was too long. It would take two years before they could have a scheme properly approved if they started to-day.

It was a case for special intervention of the Government. There was need for some simple and expeditious method which would protect the area by some general allocation of open spaces, the limitation of the number of houses per acre, and a settlement of the main lines of traffic. Plans for houses were being passed by the hundred. He had been at Bentley only twelve months last July, and he had fourteen building estates going on in his own district. The houses would be provided in any fashion unless they started at once.

The South Yorkshire district, unless they took it in hand at once, would in future be like Leeds was to-day. Leeds was paying 1s. in the £ rates for improvements they were compelled to make because there was no plan originally.

The authorities involved in this district were six urban districts, one corporation (Doncaster), and one rural district council. The area was 105,446 acres, and the population 122,646. The area was ample, although population was great.

What was regarded as a bogey was the question as to how many houses there should be to the acre.

Some had been talking about fifteen to twenty houses to the acre, but this would be going back to the old days. They wanted nine or ten to the acre.

The present by-laws allowed fifty-six houses to the acre, so it was not a

surprise to see slums existing in the district. It would be a waste of money to clear away slum-areas, and to make no effort to prevent the formation of new slum-areas.

The Hon. E. Wood, M.P. (London), said that none of them would wish to challenge the extreme importance of what they were there to discuss, nor to under-estimate the difficulties that lay in the path of that achievement. The difficulties of co-operation were equal in size to the importance of co-operation. It would ill become him to enter upon one of these difficulties, which he suspected was the real one, as between local authorities—the question of rates. And of course their imagination could easily observe other difficulties. One speaker had said what was important was to give more power to local authorities and officials. He did not love officials, but he wished to ask what would happen if these local authorities would not do these things? They had been told it would take two or three years to get any scheme into working order. What he was concerned about was what was happening in those three years. The surveyor for Bentley had urged what had always been in his mind, that if they had general good will all round and they yet had got tied up in involved machinery, what was wanted was to get these knots untied so that they might start on straight lines.

He had often wondered, if it was a sound investment for the Government to spend £500,000 on the development of Uganda, why should not they spend £200,000 on the development of South Yorkshire? This was in the first sense a national question; and if they missed their opportunities, and did not do what they might, they would be faced with the alternative of being compelled to do it twenty-five years hence at greater cost, and when it would be far more difficult to do. He was talking the other night to a member of the Housing Committee of Liverpool, who told him that in Liverpool they were prepared to recognise that their policy of housing cost £25,000 or £30,000 a year out of the rates. He ventured to say that if they went on like that they would land themselves in difficulties, but his informant said he did not think so. Under the Insurance Act the Liverpool Corporation had to pay so much per bed for their consumptive patients. This cost had so much decreased since the housing scheme was started that on the whole business, compared with four years ago, the municipality gained £15,000 a year. What they had to rely on was the good will and the good business sense of the authorities concerned.

Alderman T. B. P. Ford (Chairman, Sanitary Committee, West Riding C.C.) suggested the desirability of a joint sewage scheme for the new districts in place of a multiplication of small schemes, which were more costly and less efficient.

Canon F. G. Sandford (Doncaster) felt the time was rushing on, that very great mischief had been done already, and that with every succeeding month the

mischief would be increased. Inactivity would mean an amount of unnecessary infantile mortality and death from phthisis. All these things ought to be a matter of great responsibility to all of them, and they were bound to throw the weight of their influence into the scale, and urge a scheme for the whole district, from Askern down towards Tickhill. He had not the slightest doubt if the Doncaster Corporation, the Urban District Council, and the Rural District Council were to approach the Local Government Board they would find them extremely sympathetic. The chief responsibility rested upon the Rural District Council, but it had not realised fully the weight of responsibility it had, though it was beginning to realise it in a small degree. The members represented small, isolated villages, and they had not been able to grasp the magnitude and importance of town planning. Doncaster itself was entirely shut off from that area by Bentley, Wheatley, and Balby. The result was that they had a large number of small authorities, none of which was able to grasp the position. So far there had not been a desire on the part of the various authorities to approach one another, and so form a united body to deal with the question.

THE CHAIRMAN (Mr. H. Percy Boulnois) said a great deal had been said about a delay of three years. Where that magic three years came in he did not know. Where there was a will there was a way to reduce the time. They had heard about the scheme being so big. It need be nothing of the kind. They could take any district where the need was most urgent and begin with that. There was plenty of legislation if local authorities chose to act. They required no more legislation. They had had quite enough for many years, and they wanted a little breathing space to carry out that legislation. The whole object of legislation was to let local government be supreme, and if it did not do its duty, the Imperial Parliament should step in. Miners lived very grey lives. They wanted to give them nice houses and recreation grounds, and it was the duty of the local authority to see that this was done.

DR. A. B. DUNNE, in reply, said he had purposely refrained from criticising any authority in the paper.

HENRY SAXON SNELL PRIZE.

THE subject given in 1912 for the Essay in competition for this Prize was "The Ventilating, Lighting, Heating, and Water Supply Appliances and Fittings for an Operating Room for a General Hospital."

Ten Essays were sent in, and they have been brought under the consideration of the Council.

The Adjudicators for the Competition were Mr. Edwin T. Hall, F.R.I.B.A., Dr. Louis C. Parkes, and Mr. A. Saxon Snell, F.R.I.B.A.; and they had the advantage of the very valuable criticisms and suggestions made by Sir Frederick Treves, Bart., G.C.V.O., who kindly acted as Consulting Referee.

Acting upon the advice of the Adjudicators and of the Consulting Referee, the Council have decided to divide the Prize of Fifty Guineas, giving one half the sum to Mr. John Darch, M.R.San.I. (Wandsworth), writing under the motto "Aseptos," and the other half to Mr. H. F. V. Newsome (Manchester) and Mr. John G. Cherry, M.R.San.I. (Manchester), writing jointly under the motto "Magnum Bonum."

The Adjudicators consider that there are many excellent suggestions in each of these Essays, but on the other hand, there are some which they consider would prove unsatisfactory in practice.

A Bronze Medal of the Institute will be awarded to each of the successful competitors.

The Adjudicators also desire to commend the Essays sent in under the mottos :—

"Science moves but slowly, slowly creeping on from point to point."

"Ajax."

"Tout bien ou rien."

Notes on Essays submitted for the Henry Saxon Snell Prize, 1912.

Essay "Aseptos."

"IF hospital experience has taught one lesson more than another, in regard to the subjects of this essay, and the effort to procure a high degree of asepsis, it is the vital importance of making everything as automatic and self-cleansing as possible, so that dependence upon the conscientiousness and diligence of the employee may be reduced to a minimum."

"Surgical success is also imperilled in an overworked and therefore hastily cleaned operating room; so that in a general hospital, such as this, with probably 200 beds in the surgical wards, four operating rooms may be regarded as necessary for general and major operations; grouped on the top floor and arranged in pairs. Gynæcological and other special departments of surgery would have specially fitted operating rooms attached to their particular wards."

In these words the author indicates the main principles to be observed in the arrangement and fitting of operating theatres.

Mechanical ventilation is advocated, though it is noted of this system that complaint is made of the staleness and depressing effects of the air, and of the difficulty of quickly raising and lowering the temperature. An explanation of the former will generally be found in dark "battery" chambers packed with rough and dusty flanged pipes difficult and often impossible to clean; and of the latter, the inordinate lengths of massive heat-holding air ducts.

The reaction to natural simplicity may be instanced in an important suite of operating theatres quite recently erected, in perhaps the dustiest part of London, which are ventilated by simple open windows.

To avoid defects it is recommended that:—

1. The appliances should be local.

2. One ventilating unit should be limited to a pair of operating rooms and its three accessory rooms.

3. As the ventilation must be constant and controllable, the motive power must be equally so; hence, natural ventilation, excellent elsewhere, is unsuitable here.

4. The motive power should be divided between propulsion and extraction, a fan to each, in order to secure a balance of pressure. This will avoid the discomfort of compressed air, and the currents will be under control and independent of the opening of doors. The fans should be controlled from the operating room.

5. No system of ventilation can be successful that relies either upon indirect heating only, in which warmed air at 110° is poured into a cold room, or upon direct heating only, where cold air is admitted into a warmed room. Fresh air should enter at the required temperature (65°–85°) into a room already raised to that temperature by direct heating.

The employment of double windows would be of great assistance in avoiding the cooling effect of large areas of glass; but while it may be desirable elsewhere, its darkening effect precludes its use in a place where good light is the first consideration.

The ventilating apparatus recommended is described in a simple and readable manner, unencumbered with calculations and formulæ.

A double system of heating, direct and indirect, is advocated. The indirect heating is of course in connection with the ventilating system, and for direct heating, steam-heated radiators under the windows, formed with 1-in. copper tubes bent for free expansion set one inch apart and hinged for complete access, swinging six inches clear of the floor. To keep them bright will be to keep them clean.

Dealing with the question of lighting, the author observes that the illuminating intensity of daylight varies enormously; it may pass in a short time from 6,000 to 200 ft. candles. Apart from these variations, the illumination of an operating room would be governed, both in intensity and quality, by (*a*) the choice or size of window or skylight, (*b*) their angle of elevation, (*c*) aspect, (*d*) the glass employed, and (*e*) the area and colour of the interior reflecting surfaces. In respect of these it may be said: (*a*, *b*, and *c*) skylight and window lighting each have their advocates, and one may find operating rooms to illustrate every phase of opinion and every light and shadow difficulty.

For general operations the best light appears to be neither a top nor a side light, but such as would be found quite in the open on a cloudy day. This may be approached in an operating room by securing the widest possible angular expanse, both laterally and vertically. The aspect must be northern; any other would be too troublesome.

In deciding the position of windows and skylights it should be observed that an apparently even sky is not equally luminous. The maximum brilliance in a northern sky is usually at the zenith, and of this the mean window angle is 60%.

There are operations for which a low window light is essential, but these would appertain, principally, to rooms attached to gynæcological, throat, and other special departments of surgery.

The dark blinds required for these, and which are undesirable and unnecessary in a general operating room, should in all cases be outside. Direct sunlight should be excluded by the form of roof and not by the use of blinds.

(*d*) The glass should be that which is easiest kept clean, viz., plain, or, preferably, clear fluted. Rough ribbed, frosted, and other obscured glasses are frequently used and help to diffuse the light, but they obstruct from 30 per cent. to 60 per cent. of it, hold dirt and are difficult to clean.

(*e*) Good interior reflecting surfaces often redeem otherwise bad daylight illumination.

For the construction of the skylight it is recommended that the width

of the skylight in the operating room should be nearly that of the room, and extend at a steep pitch from the apex downward to rather low eaves, continuing thence, as a window of the same width, to within 2 ft. 6 ins. of the floor. The bars for the glass should be of rolled iron designed for easy cleaning of glass and hosing down, for protection of putty and strength in long bearings. There should be no cross bars, and the necessary purlin should be outside. Dry glazing is unsuitable; putty is better; and if a little tallow be worked into it it will remain elastic. The fluted sheet should be cut so that the corrugations fit at the laps, which should be few, and which, to be practically airtight, should not exceed half-inch in width. Such a skylight and window will give a wide dome of light, exclude sun, and effectually prevent drip from leakage or condensation.

The preparation and anæsthetising rooms need a quieter light, and will be best served by tall windows, the former having also a moderate skylight.

For artificial lighting (electric) the author indicates the following conditions:—

1. The illumination to be sufficient. Minimum 15 foot candles.

2. The light to be thoroughly diffused. The greater the diffusion the easier and clearer the vision.

3. No exposed light sources to be within the field of vision. They should be either kept high or screened. This will assist vision and ensure eye comfort.

4. The colour to approach daylight as nearly as possible. A correct estimate of colour is dependent upon that of the light.

5. The light to be steady. Fluctuation and flicker are disturbing and injurious.

6. The collection and dissemination of dust to be avoided, Better no fittings in the room, but if essential, they should be fixed, smooth, easily cleaned and simple.

7. Provision to be made for emergency lighting in case of breakdown.

He adds that interior reflecting surfaces, particularly those of the upper walls and ceilings, are factors in the success of any form of direct lighting, supplying the much needful diffusion. In indirect lighting they are, of course, the essential medium. In the ordinary operating room with white ceiling and walls, they will add 70 per cent. to 100 per cent. to the value of the illumination and improve its quality. As, however, relief is needed for the eyes, and the lower part of a room contributes little to the illumination, there should be a dado of a pale, preferably green, tint and the floor should be much darker.

The details of lighting are set forth clearly both in the essay and upon the drawings; but the proposed method of external lighting seems not to be practical. It would be impossible to keep the lamps steady even in a moderate wind.

In connection with water-supply fittings, the author notes that as the asepsis of the operating room must be the dominant factor, in any scheme it should at once be stated that the best plan will be to keep all fixed fittings entirely out of the room.

The instrument steriliser and the surgeon's lavatory are the fittings most likely to be required during an operation; the former is within four steps of the table, and the latter is reachable through a hatchway.

He has much to say also with respect to the provision of sterilised water, and the best means of securing it at proper temperatures.

Some excellent and novel suggestions are made for sinks and other fittings, and it is suggested that it is a mistake to fix any of these clear of the walls, for the back cannot be seen and access is difficult. It may be noted, however, that if fittings are placed a sufficient distance from the walls, no difficulty need be experienced in seeing and cleaning the backs.

A good suggestion is made for floor channels, but it would not do away with the necessity of cleaning from time to time.

The author draws attention to the defects of the usual open waste pipe to discharge sinks over the floor channel, and suggests a method of construction for keeping this pipe clean; but it would appear far easier and more effective to keep these wastes straight, and to clean them with a long-handled small mop or bottle-brush.

Essay "Magnum Bonum."

The authors illustrate their ideas with a clear and well-worked-out plan, and generally with good drawings. Their operating room is circular on plan, and about half the circumference is glazed, but the lighting is somewhat spoiled by large piers which seem scarcely necessary.

All the floors are specified to be constructed of Ferro-concrete, with a covering, as a floor surface two inches thick, of patent impervious and sound-proof material, such as "Plastoment," finished to a fine surface, the angles being rounded to a six-inch radius.

A dado is shown, seven feet high, of opal glass tiling in slabs of four feet by three feet, all angles rounded and of a pale green shade. Above the dado the concrete walls are brought to a fine finish in Keene's cement.

(N.B.—Opal glass in such large slabs and set in cement is liable to crack badly.)

The doors are specified of sheet iron with wrought iron frames finished flush with the plaster. Possibly such doors can be made without angles and mouldings, but slate or marble slabs are simpler.

In dealing with the question of ventilation, the authors assume that the hospital has a "regular supply of properly purified water and cold air, supplied through ducts and purified at a central station, and filtered under a slight pressure into the various apartments."

(This, by the way, is a large assumption. Plenum ventilation has been adopted throughout in but few hospitals, and there appears to be little likelihood of further experiments in this direction.)

The authors suggest further purification at the point of entrance into the theatre block. The drawings show the ducts and apparatus in detail.

For direct heating a peculiar and rather ingenious form of radiator is shown; the idea of this fitting is to give a greater available range of temperature than is possible with the ordinary arrangement of inlets, and it is thought that this fitting would do so very effectively, as the incoming air could be warmed to any required temperature.

It is intended to get up the heat in this radiator by a steam supply through a coil inside the radiator. This coil would raise the temperature of the water on the "high pressure hot-water system," the whole being sealed to enable the radiator to assume such a shape as will allow of perfect cleaning, and doing away with the necessity of the loops now so common in the usual pattern of radiator. It is admitted that the shape suggested does away with a large amount of heating surface, but it is thought a more important point has been gained, the loss of heating surface being made up by the increased temperature to which the water can be raised.

The hot and cold water-supplies are clearly indicated on the drawings.

Artificial lighting is described at some length and with some excellent illustrations.

Several novel and ingenious forms of lavatory basins and sinks are shown. The taps to basins are operated by standing upon a small platform let in flush with the floor, all parts of which are made for easy removal and cleaning. Even so it is doubtful whether its inherent disadvantages would not outweigh the possible conveniences.

Sinks and fittings are well described and shown, and the whole of them are specified to be clear of the walls.

A bath, lavatory, and water-closet are provided for the surgeon.

NOTES ON LEGISLATION AND LAW CASES.

These notes are copied by permission from The Law Reports published by The Incorporated Council of Law Reporting for England and Wales.
For full text of these see Law Reports, which can be referred to in the Library of the Institute.

NUISANCE.—*Injunction—Fried fish shop.*

A fried fish shop, carried on in close proximity to a dwelling house, may cause an actionable nuisance, and will be restrained if the evidence shews that the odour causes "an inconvenience materially interfering with the ordinary comfort physically of human existence" within the definition contained in the judgment in *Walter v. Selfe* (1851) 4 De G. & Sm. 315.

ADAMS v. URSELL. Swinfen Eady J. Ch. Vol. I. Part III. March, 1913. 269.

Volume XXXIV. No. 4. **Issued May, 1913.**

JOURNAL

OF

THE ROYAL SANITARY INSTITUTE

Eighth Report of Royal Commission on Sewage Disposal, on Standards and Tests for Sewage and Sewage Effluents discharging into Rivers and Streams, by SAMUEL RIDEAL, D.Sc., F.I.C., F.C.S., J.P. (FELLOW).

Read at Sessional Meeting, London, Tuesday, February 11th, 1913.

THE latest issue, published on November 21st, 1912, by the Commissioners appointed in 1898, is entitled "Standards and Tests for Sewage and Sewage Effluents discharging into Rivers and Streams; Vol. 1, Report," and promises that "in our next and final report we shall deal with methods of disposal not involving water carriage, and with standards in regard to trade effluents."

Many passages imply that this is a completion and amendment of the Fifth Report, and we have therefore in sight a finish to the long investigations of fourteen years, and a summing up of the previous inconveniently voluminous, though valuable, reports. I hope that the Commissioners will publish in their final report a general index and concordance to the whole series, such as was ably done independently by A. J. Martin for the earlier sections in his book called "The Sewage Problem," 1905.

It would seem that, according to paragraph 12, the Commissioners consider that their main objective is primarily the improvement of rivers and only secondarily the improvement of effluents, although everyone has looked for their prescribed decision as to the best means of purifying sewage, and also how far it was possible to recover some of the constituents for agricultural purposes.

The Commission's Fifth Report concluded from the evidence collected that the extent of purification necessary varies with the particular con-

ditions of the town or river concerned, but indicated (paragraph 311) that the statute law at present recognises no graduated standards of purity for sewage effluents, and that under the Rivers Pollution Act of 1876 no local circumstances may be taken into account. The Commissioners are strongly of opinion that the law shall be altered in this respect, and formulate details of a new Act under which "Local Authorities shall not be required to purify their sewage more highly than is needful to obviate actual nuisance, from smell, over-development of grey algal growths, accumulations of putrefying sewage solids, and detriment to fish life" (paragraph 4).

The work of the Commission shows that there is a general correspondence between the character of the recipient waters and the analytical figures obtained in the laboratory, and therefore proves the importance of control chemical analyses, and suggests that the chemist can decide the nature of the necessary purification works in any given case from the data obtained. It follows that it is necessary to take into consideration the nature and volume of the recipient waters before expressing an opinion as to the suitability of any disposal works, and this duty will in future be carried out by a Central Authority and Rivers Boards.

Previously used tests for albuminoid ammonia, oxygen absorbed from permanganate, and others, are abandoned, and main if not sole reliance is to be placed on the estimation of dissolved oxygen. The determination of ammoniacal nitrogen is said to be the most delicate chemical index of *recent* sewage pollution of a river water (paragraph 8), but is not prescribed as a routine test.

It will be recollected that the proposals in the Fifth Report were that the absorption of dissolved oxygen by an effluent should be limited to 0·5 parts per 100,000 in 24 hours, 1 part in 48 hours, or 1·5 parts in 5 days, *when the matters in suspension were filtered out.* The idea was that the liquid only should be tested, the solids being regulated by another rule, that they should not exceed 3 parts per 100,000. These units for the liquid were generally accepted as defining an allowable effluent, but experience showed that the clause concerning filtration through filter paper had to be amended as not practicable for two reasons: (1) that sewage and effluents often contained a cellulose-dissolving enzyme, which reduced the paper to a pulp and stopped any filtration; (2) that even if the liquid filtered fairly easily, oxygen was absorbed from the air in the process. These points should have been seen before the Report was issued.

In general practice the sample had been allowed to subside in a closed

bottle, the liquid decanted or syphoned off and tested for its oxygen content, and the suspended matter separated and weighed.

The Eighth Report (paragraphs 21, 22), recommends, however, that the dissolved oxygen absorption test should be applied to the effluent not filtered *but with its suspended solids*, and that absorption of dissolved oxygen should be fixed at 2 parts per 100,000 in five days at 65° F. This coupled with the proviso that the effluent does not contain more than three parts of suspended solids is the general standard which it is now recommended should be prescribed by statute, or by order of the new authority, for ten years.

We must strongly object to the duration of five days as compared with the 24 and 48 hours alternative times laid down in the Fifth Report, which were long enough in practice and were generally adopted when the Fifth Report was welcomed. A protraction to five days is inadvisable for a control test; in that time the water of most English rivers would be down to the sea, and the absorption in 24 hours is quite sufficient to show the pollution.

The Royal Commissioners apply the same delay of five days to the test of a recipient water, as judged by their own standard in paragraph 11, that "if 100,000 cc. of river water do not take up more than 0·4 gram. of dissolved oxygen *in five days*, the river will ordinarily be free from signs of pollution, but above this figure it will almost certainly show them."* "This figure (0·4) we term the 'limiting figure,' and in our opinion it should be the foundation upon which any scheme of standards should be constructed (p. 3) in order to ascertain 'the minimum degree of purification which would be sufficient to obviate risk of nuisance.'" On these grounds a formula is given (paragraph 22, p. 6) to calculate dilution. It is:—

$$\frac{X + YZ}{Z + 1} = 0{\cdot}4.$$

* It would have been as well if a note had been inserted in paragraph 11, p. 3, explaining a point that has often at first caused difficulty. The dissolved oxygen has sometimes been recorded by *volume*, and sometimes by *weight*. Fortunately they are easily converted one into the other if we remember that 700 cubic centimetres of oxygen normally weigh 1 gram. Therefore 7 cc. per litre, the average amount of oxygen found in fresh water saturated with it, equals 1 gramme of oxygen per 100 litres or 100,000 grammes of water. Consequently we have the simple rule that:—

Parts by volume (cc. per litre) divided by 7 = parts per 100,000 by weight.

The volume method of recording the figures was formerly the most usual, as a direct result of volumetric determinations by gas apparatus, and was expressed in cubic centimetres of oxygen per litre of water. This way is still frequently used, as for example, in paragraph 33, p. 8, of this Report, where it speaks of ordinary water containing 6 to 7 cc. of oxygen per litre, and says that the amount should not be reduced below 4·0 cc. (as an example this is $\frac{4}{7} = 0{\cdot}57$ parts per 100,000).

At the same time when easier gravimetric processes were introduced, it was felt that an expression by *weight* in parts per 100,000 in the same way as the other constituents was preferable as showing directly the ratio between the oxygen and the organic matter.

When X = parts of dissolved oxygen taken up by 100,000 of effluent;
Y = parts of dissolved oxygen taken up by 100,000 of river above outfall;
Z = dilution, or proportion of river water to effluent.

An example is cited of a deduction from the formula, that "if an effluent is discharged with ten times its volume of water, which itself takes up 0·1 part of dissolved oxygen in five days, the effluent in this case may be permitted to take up 3·4 parts of dissolved oxygen per 100,000 in five days, and that figure would be the standard for this particular discharge."

Unfortunately (paragraph 14) the Commissioners have discounted their own formula, on the chief ground that it would be difficult to administer. Therefore the proposal that the general standard for an effluent should be capable of being relaxed, so long as the river does not reach this limiting figure, gives a possibility to many authorities of being released from their obligations of purifying their sewage up to such a high standard.

What is wanted is an immediate test of the *present state*, such as the one laid down by the New York Commission, that the water shall not fall below a content of 3 cc. of dissolved oxygen per litre (0·43 parts per 100,000 by weight), which is equivalent (Report New York Metropolitan Sewerage Commission of 1912, p. 70), in the case of their mixture of fresh and salt water at summer temperature, to 58 per cent. of saturation. Their determinations were made from an open boat on the spot, and the limit agrees with general experience.

Our Eighth Report, p. 8, states that "when the oxygen of a river is reduced to about 4 cc. per litre (0·57 parts per 100,000 by weight) the water is usually in a doubtful condition, and is on the verge of producing nuisance; when the oxygen is reduced still lower nuisance may be expected."

But it is significantly said in paragraph 23 that under no circumstances must compliance with the standard be held to justify the use for drinking purposes of streams receiving these effluents without subsequent treatment by the waterworks authority.

At the end of the Report a sliding scale (p. 17) is suggested, founded on the formula, for the degree of dilution with "relaxed," "general," and "more stringent" standards, all under the original discretion of a "central authority," so that conditions would not materially differ from those at present, and instead of advice as to methods of sewage treatment we are given variations on the primeval method of disposal by dilution. Thus it

is suggested that the sliding scale be applied also to the suspended solids, and allows six parts per 100,000 of suspended solids when the dilution is 150–300 volumes, and fifteen parts from 300–500, while with dilutions of over 500 volumes no sewage purification of any sort need be undertaken if screens are provided before discharge.

An omission in the Report is that no reference is made to a standard for the surface. Visible scum, or a film of oil, which is called in America "Sleek," is a serious nuisance. The oil would not be included in the figure for suspended solids, but has a retarding influence on the natural purification and on the rate of absorption of oxygen, so that apart from the unsightly appearance there are other important objections. Seeing that the tarring of roads and the use of lubricating oils for motor cars are now so general, the difficulty may increase, and should be noticed in any proposed standards.

We congratulate the Commissioners on having so prominently recalled the fact that aerial nuisance is usually absent while a good level of dissolved oxygen is maintained. If at any particular moment an inspection of the water is made, and a test *in situ* shows serious deficiency of dissolved oxygen, immediate remedial steps are called for. Such a trial is easily and shortly made, but the examination must be applied and answered throughout the whole course of the river; and a sewage-discharging authority is not fulfilling its obligations to the community by the mere stipulation that immediately below its outfall the dissolved oxygen *in situ* has not fallen below 4 cc.s per litre (corresponding generally to an absorption of 0·4 parts per 100,000), since this, as pointed out in par. 32 of the Eighth Report, gives no guarantee that, before fresh pollutions occurring lower down, the water will have recovered sufficiently (by natural oxidation and bacterial action) to prevent nuisance arising at the second point. The paragraph empirically suggests that it should be the aim of the responsible authority to ensure not only that the river water should take up no more than 0·4 part of dissolved oxygen immediately below the first point of pollution, but that it should take up no more than 0·2 part immediately above the second. The Report recognises that in many cases even this might enforce on the second authority a greater purification than on the first.

It is fair that each authority should be called upon to purify its effluent to the extent that it should not bring the river below 4 cc.s per litre of dissolved oxygen, and that this should be insured by inspection along the course.

The Commissioners consider that their duty was to make recommendations for the improvement of rivers and only incidentally for the

improvement of effluents. They have attempted to accomplish this by suggesting that the purity of a stream in future can be ascertained by one test and one test only, the rate at which it absorbs oxygen from the air. They point out that there is no such thing as a pure river anywhere, but we take it that a pure river would be one which did not absorb oxygen from the air, but would remain in equilibrium with the air and be fully saturated with oxygen at the temperature from time to time. The Commissioners do not think it possible ever to get the rivers of England into this condition, and hold that at present they can be divided into what are termed "very clean," "clean," and "fairly clean" rivers, being those which absorb 0·1, 0·2, and 0·3 part of oxygen per 100,000 in five days at 65° F. They suggest practically that streams in Britain need not live up to this present standard of "very clean," "clean," and "fairly clean," but in a coming period may be so impure as to absorb 0·4 parts of oxygen in five days at 65° F. *below a sewage outfall*, but that *above sewage outfalls* rivers must not absorb oxygen at a greater rate than 0·2 parts per 100,000 in five days. In future the rivers of England must therefore, according to the Commissioners, be supervised by a Rivers Board, who will see that the condition does not go outside the range thus prescribed, and the difficulty will arise when it is found that the water above a sewage outfall is not what is called in a "clean" state, viz., that it is taking oxygen from the air at a greater rate than 0·2 parts per 100,000, the limit suggested in this Report, as it is clear that so long as the stream exceeds this figure no sewage can be permitted to be discharged into it, however purified. A river must, therefore, range between 0·4 below and 0·2 above the next outfall. It seems to me that a dual standard of this description will not work out as an improvement, and whilst it is obvious that below outfalls the character must almost necessarily be debased, to fix this variable standard only for the quality of the water ignores some of the other more important factors. The Commissioners say that inclusively "very clean," "clean," and "fairly clean" rivers may have an absorption of 0·2 part of oxygen per 100,000 in five days, and if showing this average are in future to be allowed to take sewage effluents up to such an extent as to cause the rate of absorption of oxygen to be increased to 0·4. The net result, therefore, of the recommendation of the Royal Commission is that what they call the second group of rivers, viz., "clean rivers," will be made dirtier, and, therefore, such recommendations are not for the improvement of rivers, but tend to deteriorate their quality; and to paraphrase the Rivers Pollution Act, Section 17, we are to say that the sewage or other excrementitious matter will not deteriorate the quality

or purity of any stream or watercourse, even when it increases the rate of absorption of dissolved oxygen from 0·2 up to 0·4.

If the rate of oxygen absorption is the only standard, other very serious kinds of deterioration may be admitted, as for example: (1) The addition of *B. typhosus* to a stream which milch cattle have access to; (2) the discharge of crude sewage into tidal waters near oyster beds; (3) the addition of non-sterilised effluents to streams used for watercress culture. Having fixed in their own minds this dual standard for the quality of the rivers in future, it follows that variable effluents can be discharged into these rivers without infringing these conditions in certain places. On the other hand it will be exceedingly difficult in many places to discharge into a river an effluent, however much purified, which will not temporarily reduce the river to a lower figure than 4 cc. per litre. Probably on this account the Commissioners do not attempt to fix a standard for an effluent, although they say that the general standard should not absorb more than 2·0 parts of oxygen in five days. Let us take the case of such an effluent discharging into a river equal in volume to itself. The rate of absorption of oxygen after admixture will exceed the standard, and it is therefore impossible for a town like Birmingham to discharge into the Tame an effluent having the general quality suggested. In this case, therefore, the Commissioners say that instead of the general standard a more stringent standard must be adopted.

No town in future can exist on a river whose volume is not at least four times that of the effluent unless its quality is much above the general standard. Similarly no town in future can discharge into the same river as a town higher up unless it is sufficiently distant away for the river water to have ceased absorbing oxygen at the 0·4 rate and become "clean." Nitrates in effluents have no future value, and storm water will still give rise to difficulties.

THE CHAIRMAN (Col. T. W. Harding) said that the recommendations of the Eighth Report of the Commission, like those of the previous reports, could have no legal force until they were embodied in an Act of Parliament. The Eighth Report had been spoken of in somewhat strong terms, having been described as revolutionary and reactionary, but such terms did not necessarily condemn it. He saw in the New York *Engineering News* that the proposals of the report were spoken of as being as revolutionary for England as they were rational, scientific, and practicable for that or any other country. There was no doubt the recommendations in the report were disturbing, because it was proposed that there should be a statutory standard and a new form of test which was to be the basis of this, while certain

relaxations would be permitted according to local circumstances. Hitherto there had been no statutory standard by compliance with which a local authority could avoid prosecution. Many witnesses, especially those representing supervising bodies, gave evidence that it would be impracticable to have a statutory standard. He agreed with that if it were proposed to have a rigid one, to which all had to conform. But if it were not rigid in character, if the permissible deviations were few, and on common sense lines, and if the standard itself were within the limits of what had been shown to be practicable, he thought a standard would be useful. On the one hand local authorities very naturally asked this sort of question: "Tell us what you expect of us, and if it is reasonable and practicable, and we can afford it, we will try to carry it out, and all the more readily if you can assure us that you will ask nothing more for, say, another ten years." On the other hand, the river boards and active county councils had found themselves compelled to adopt some standard; but the standards differed as also did the tests on which they were based, and it was not surprising to find that they had little weight in courts of law. It seemed desirable, therefore, that all these varying standards should be brought into line. It was interesting to find that judges had required to be satisfied, not as to the figure of impurity in a given discharge, but as to the effect of the discharge on the stream, whether or not it brought about any nuisance. That was a common-sense view, and one which had influenced the commission in their recommendations in the Eighth Report. If a statutory standard were fixed it must be based on this: that the governing condition of a discharge was its capacity to bring about a nuisance in any form in the stream. He thought that discussion might show less objection to the fixing of a standard than to the form of test upon which it was proposed to base it.

The objection to the proposed five days' oxygen absorption test recommended in the report had been opposed because it had been found to give a great deal more trouble than the four hours' permanganate test. That might be, but if the permanganate test required to be supplemented by other tests, and in addition to that they had to estimate the amount of albuminoid ammonia and the quantity of nitrate, the question was whether it did not involve more trouble than the single test they proposed, which approached more nearly to natural conditions, and gave a better idea of the way in which oxidation was likely to proceed in the stream than was possible by the use of a vigorous oxidising agent like permanganate. Objections had, of course, been made that the report did not state what were the relative volumes of effluent and diluting tap water, and it had been suggested that if that were not fixed the results would not be comparable, and that they would vary very much. He regretted that it had not yet been possible to publish appendices, dealing with all those matters. The main feature of the Eighth Report was that they did not propose that an effluent should be considered only *per se*, but judged by its effect on the stream; that is to say, the real object to be aimed at was the prevention of nuisance in any of the

forms associated with polluted water. During the time he was chairman of the West Riding Rivers Board he was long attracted, he confessed, by the simplicity of laying down such conditions that an effluent flowing by itself in a channel, without dilution, would not give rise to nuisance; but his views had been considerably changed as a result of the observations made by the officers of the Royal Commission, some interesting particulars of which they would find in the appendices about to be published. They found, of course, that there was no such thing as a perfectly pure river water; their observations showed that clean water might take up about ·2 of oxygen, and the important point was brought out that if a river water did not take up more than ·4 of oxygen under the conditions of the test there was no likelihood of any nuisance arising. But that was the border line, the limiting figure; the moment any water exceeded that limit of ·4 there was a probability of nuisance, and if it exceeded it considerably they would find evidence of nuisance. If an effluent was to be considered by itself, and to be so conditioned that, flowing by itself without any dilution it was not liable to develop nuisance, the standard would have to be, that on the five days' oxygen test it should not take up more than ·4 of oxygen. That standard would, in most cases, be impossible of attainment within reasonable limits of expenditure. It would be too drastic, and unnecessarily so, for it was rarely the case that an effluent was not diluted by from at least 8 to 10 volumes of river water. The statutory normal standard proposed by the Eighth Report was based on a dilution of the effluent with 8 volumes of clean river taking up ·2 of oxygen in the five days' test; that was to say, an effluent conforming to the normal standard if mixed with 8 volumes of clean water would give a mixture which would not take up more oxygen than the limiting figure of ·4. He granted that a literal and logical application of this dilution principle would result in a special standard for each discharge, and even a varying standard for each, but the Royal Commission did not propose anything of the kind: it would be impossible of administration. What they did propose was that there should be a normal standard generally applicable to most places, with provision for fixing one or two lower or possibly higher standards where local circumstances appeared to justify it. The normal standard would be the only statutory standard. There would be no statutory right to relaxation because of dilution, but certain conditions of dilution would warrant a *primâ facie* case for consideration by the Rivers Board or central authority, as, for example, if admixture did not bring the water to such a condition as to take up more than ·4, and if the river were able to return to the normal ·2 before the next pollution. But the central authority, in considering such cases, would have to take into account other conditions than those of dilution, and would specially consider neighbouring sources of pollution, and such matters as the presence of weirs, the velocity of the stream, and so forth. His own belief was that cases like those of certain Yorkshire rivers, where pollutions succeeded each other rapidly, and where, besides sewage effluents, they had many trade effluents

of large volume that discharged within a certain reach of river, would have to be dealt with *en bloc*, and it seemed unlikely, in such cases, that any relaxation would be permitted to any individual discharge. They must look at the matter from a broader point of view than that of the special stream with which they might happen to be concerned.

Dr. H. Maclean Wilson (West Riding Rivers Board) said the discussion seemed to range under two heads, whether a statutory standard was desirable, and whether the test suggested was a suitable and reliable one. With regard to the second of those questions, he thought the Commission had made a great mistake in trying to get a single test by which they would be able to say whether a sewage effluent was good or bad. It was impossible in the present state of their knowledge to express an opinion of that kind on a single test. As to a definite statutory standard, it had been under his consideration for many years, and he was of opinion that it was neither desirable nor practicable. If there were a fixed statutory standard, everyone would admit that it would be unfair to apply it to all kinds of places. His own impression was that it was right that the same standard should not be asked of every authority, and that some machinery should be devised for allowing varyiug standards, and this would result in every case having to be decided on its own merits. The Commission had not been very fortunate in their suggestions. He regretted that they had arrived at the decision that in certain instances there was no need to treat sewage at all beyond rough screening, and in other cases settlement, and he regarded the step as reactionary. One important point had not been dealt with in the report. The Commissioners did not say whether they intended that the provisions of sec. 17 of the Public Health Act should be repealed or not, that was to say, that no authority should be allowed to discharge effluent into a stream and deteriorate it, nor did they say whether the rights of action of riparian owners were to cease when the suggested standard was complied with. He thought that, if the latter were intended, it was a very serious matter from the point of view of public policy, because it put the settlement of very grave and important rights in the hands of a Government bureau. He believed that Parliament would not view that with any great approval, and they should not. The aims of the Commission could be obtained without fixing any statutory standards, which would hamper the proposed central authority.

Mr. John D. Watson (Birmingham Tame and Rea District Drainage Board) remarked that the law, as it stands, tended to induce waste of public money. By the 17th section of the Public Health Act, a local authority might be called upon to construct works which were entirely unnecessary to maintain a reasonably pure stream. With the advent of the Fifth Report of the Royal Commission it became evident that there was a prospect that common sense would be applied to the question, and now that the Eighth Report had been published they were

nearer realising the hope that the ratepayers' money would be expended on improving their rivers, instead of producing high-class effluents irrespective of the volume and condition of the river into which they were discharged. Some time ago he gave it as his opinion that the sewage discharged from a village into a river more than two thousand times its volume would do no harm, provided the solids were extracted, but the Court held that it would be a breach of the 17th section of the Public Health Act to discharge a liquid which was less pure than the river itself at the point where it entered. Even those who claimed to be enthusiastic sanitarians could not justify, on sanitary grounds so inequitable, although legal, a judgment. It must be recognised that the oxidation of impurities went on in water just as it did on land or on specially prepared biological filters. He had always held that it was unwise to apply a hard and fast standard to sewage effluents, and he had not changed his mind in that respect, although he had to admit that the Royal Commission had to a large extent disarmed opposition by indicating that the standard which they suggested was in the nature of an ideal to be aimed at, without attempting to make it cast iron in its operation.

As he understood it, the suggested standard was a mere guide, and it would be for the river authority, and (on appeal) for the central authority, to determine what each purification plant should be required to do, in relation to the stream into which the effluent was discharged. This course would place great powers in the hands of the officials of those authorities, and it was to be hoped that the men who were to determine what each standard should be, were level-headed and far removed from the kind of men who were designated sanitary cranks. Apart from this the only criticism which he offered upon the proposal was to question the wisdom of fixing the temperature of the test at 65° Fah. In constructing works in England to purify sewage, engineers were justified in assuming that they were dealing with the average English temperature. It would be absurd to build a bacteria bed in England as if it had to withstand a Canadian winter or an Indian summer; nevertheless, arctic weather is experienced for a short time occasionally, and in 1911 we had a few weeks of really tropical weather, which rendered biological filters more or less offensive. The dissolved oxygen test was proposed for application at a uniform temperature, and there was room for some modification of the test to render it more in harmony with the existing state of the weather. It was impossible to get as good results in winter as might easily be obtained in summer. We must not, however, view the recommendation of the Commission from a narrow standpoint; they had given us a lead, and we should follow that lead and contribute helpful rather than destructive criticism if we wish to see their general recommendations converted into a Statute.

DR. ADENEY (Dublin) said in his opinion the Report should be read in conjunction with those previously issued by the Sewage Commission, and it

would then be found that the labours of the Commission had resulted in rescuing the obscure and difficult problems of sewage disposal and the protection of rivers from injury by sewage pollution from a condition of hopeless chaos, and in laying a sound scientific foundation for the satisfactory consideration of those problems. They had, moreover, clearly indicated the paths along which future research should proceed.

He would like to devote the time at his disposal to a consideration of the test that the Commission had recommended for employment in determining the standards that they had proposed for application to sewage and to sewage effluents discharging into fresh streams. The Commission had very properly abandoned empirical tests for the purpose, such as the albuminoid ammonia and acid permanganate tests, and had adopted the dissolved oxygen absorption during five days' test. This action on the part of the Commission was justified by all the information that had been gained of late years with regard to the bacterio-chemistry of sewage-polluted streams. The Metropolitan Sewerage Commission of New York had also adopted the dissolved oxygen test, to the exclusion of empirical tests, in connection with their investigations into the condition of the waters and bed of New York Harbour, one of the most, if not the most, exhaustive investigations of a tidal water that had yet been made. The test possessed the great merit of providing the means of exactly estimating the quantity of harmful constituents in sewage, and in sewage effluents, in terms of the quantity of dissolved oxygen which they would absorb during the self-purification of the stream waters with which they might become mixed; and, what was also of the greatest importance, the test took no account of the harmless organic constituents in sewage and in sewage effluents. On the other hand, the albuminoid ammonia and acid permanganate only yielded empirical or qualitative results. They, furthermore, not only made no distinction between the harmful and harmless organic constituents of sewage and of sewage effluents, but unfortunately were also more sensitive to the harmless than to the harmful constituents, and were therefore quite incapable of affording reliable data as regards the strength and quality of a sewage or sewage effluent, or of indicating what effects such would exert when discharged into a given stream. On the contrary, when these tests were employed for such purpose, they were both misleading and mischievous, as was shown by the Sixth Report of the Commission. It could not be too strongly emphasized in the interests of sanitary science that these empirical tests were only proposed by their authors for the classification of potable waters, the sources of which were known and could be investigated; and that their continued use in connection with sewage purification and disposal problems could not be justified, now that the dissolved oxygen test was so well known and so widely recognised. As regards the difficulty of carrying out the dissolved oxygen test, he thought that it had been very greatly exaggerated, personally he had found none, and he had seen the test effectively carried out without difficulty by analysts both in this country and in

America. A further advantage of the dissolved oxygen test was that its operation could be extended without difficulty by the ordinary well-trained analyst to include the estimation of the products formed during the absorption of dissolved oxygen; the method then became available for exact research, and the study of sewage and of sewage-polluted streams became a branch of exact science, rather than a matter of mere speculation, as it would remain so long as empirical tests were solely relied upon in its study. With reference to Dr. Rideal's questions regarding the standards that had been recommended for tidal waters in Appendix VI. to the Fifth Report of the Commission, he would be very glad to discuss them at some other time, but the subject for discussion that night was the Commission's standards for non-tidal waters. He would only remark that the Commission had specifically recommended that the general standard which they had formulated for non-tidal waters should not be made obligatory to tidal waters.

MR. G. A. HART (Leeds) said the chief anxiety which arose in his mind in considering the recommendations of the Eighth Report was due to what appeared to him to be the apparent lack of reference to practical difficulties which would inevitably arise if they became embodied in future legislation. Those sanitary authorities situated within the area of a rivers board conservancy at the present time were required to conform with provisional standards of a discretionary nature. Standards had been provisional because it had been hitherto impracticable to further consolidate or broaden out any basis of standard. The Commission evidently believed that their investigation into the origin of rivers pollution and the means available in practice for its prevention warranted the establishment of a legal statutory standard with qualifications in general principle. His own view on this important subject was that such a course would be impracticable, because it would be found necessary to institute so many qualifications to the main principle of a standard that the existence of a principle would have been completely undermined, and a consequent sense of injustice and resentment might be ingrafted in the minds of those who were compelled to comply with the requirements of a statute so framed.

The establishment of a central authority, fortified with the knowledge of the labours of the Commission, and authorised to determine what should be done by sanitary authorities and others to prevent rivers pollution without recourse to courts of law, would be generally welcomed. On the other hand, if they were to have a statutory standard, and it was not to be used in a truly legal sense, why have it? If a central authority was to be established, to whom appeals on the decisions of rivers boards might be made without resorting to law courts at all, it seemed that such an authority, generally armed with the powers stipulated in section 17 of the Rivers Pollution Act, would probably meet the present requirement.

In determining the effect of an effluent upon the river, consideration should

be given to the amount of dry-weather flow of the river which formed a diluent. In the West Riding of Yorkshire navigation authorities had powers authorising them to use the dry-weather flow of the river for the purpose of conducting their navigation. As an instance of this kind, in a dry summer the river Aire, at the point where the sewage effluent from the Leeds Sewage Works would be discharged, was liable to be deprived of the whole dry-weather flow in this way, and the advantage which would otherwise accrue to them of a diluent was lost, so much so that if the degree of pollution was to be judged by the effect upon the flow of water in the river, it could be urged that there was no effect upon something which did not exist. The authorities, under these conditions, might with equity urge that consideration ought to be given to the amount of river water which would otherwise flow along the bed of the river if it were not diverted in this way, and anomalies of a like character would be plentiful throughout the country.

Dr. Gilbert Fowler (Manchester) said he was of opinion that the two tests chosen by the Royal Commission gave the best idea of an effluent one could get. If it came to making a rigid standard, he agreed with Mr. Watson that it was impracticable and highly dangerous, because, he ventured to say, if they wanted to "catch" any works, it could be done in a single day by watching the outfall. River authorities were, as a rule, reasonable people, and looked at the condition of the river. The condition of the river was the main thing, and it was a step in the right direction that the Royal Commission had aimed at: getting a good river. The real difficulty was that of administration, and he suggested that it might be found best for a watershed to be considered as a whole by some central authority, and the condition of the river or rivers in it determined to begin with by the general sense of the community which would be represented on such a central board. It was right to say what should be a standard for any given watershed. All the authorities in the area would contribute to a general sewerage and sewage disposal rate and works constructed as required by the circumstances. The cost would then be borne equitably by all.

Mr. Baldwin Latham put a question as to what the Royal Commission meant by "nuisance." His own experience had shown him that a river might be so denuded of oxygen that it would not support fish life, and still there would be no smell or nuisance.

Mr. W. Kaye Parry (Dublin) pointed out that from the first Dr. Adeney had advocated the adoption of the oxygen absorption test, and he thought one result of this Eighth Report was to show that Dr. Adeney had all along been working on right lines. The Report would be extremely satisfactory to engineers in Ireland.

DR. McGOWAN, discussing the question of the period over which the dissolved oxygen absorption test should extend, said it had to be borne in mind that the longer the time taken the less risk there was of any slight differences affecting the result. With a twenty-four hours' test any error of experiment would be relatively greater. The five days' test appeared to be the safest, having regard to everything. As regarded the question of temperature, the figure given in the Report had been arrived at on the basis of a number of temperature records of different rivers, taken by Mr. G. B. Kershaw; speaking from memory, in only one instance had a stream temperature higher than 65° F. been observed. (This did not include streams in certain manufacturing districts.) It had been objected that this standard test did not indicate the nature of an effluent, and how far an effluent had been purified, but the object of a standard was not to do that, but to show the effect which an effluent might reasonably be expected to have on a river.

MR. A. P. I. COTTERELL (Westminster) considered that the recommendations of the Royal Commission were a reasonable attempt to make the penalty for sewage pollution proportionate to the offence. Instead of one hard and fast standard of punishment, where the least guilty sometimes suffered worse than their more guilty neighbour, there would at least be a differentiation between them, based on more intelligible reasons than at present. The great feature of the Report was what Dr. Rideal had called a revival of the primæval method of disposal by dilution. Why should they not adopt primæval methods? Dilution was nature's great method of dealing with all water-borne debris, and had been ever since the world began. Every river was, in a sense, a drain carrying away and disposing of organic matter from the land, quite apart from whether man was living on the face of the earth. At the same time the recommendations would be very far-reaching, and instead of levelling down, as anticipated by many, the general tendency would be to level up. He agreed with the proposition that it was the river and not necessarily the sewage effluent to which purification should be directed. To purify the effluent was to purify the river, but the extent of purification depended upon the river into which the effluent discharged.

They would be able to learn more about the proposed administration of the rivers boards when the appendices to the Report had been published, but no one could doubt the need for a central authority and for rivers boards. They were urgently required to deal with questions of water supply as well as with those of sewage disposal.

MR. W. H. MAKEPEACE (Stoke-on-Trent) pointed out that the recommendations contained in the Eighth Report had a disturbing effect on the county borough of Stoke-on-Trent, which was situated on the upper reaches of the river Trent. Three of the tributaries and the Trent actually passed through the borough.

The borough had six sewage works, which discharged their effluents into those streams, and the volume in the summer months was rarely more than three fourths of the volume discharged into it from the several works, of which the new well-known Hanley works was the largest, and his authority was concerned with that portion of the recommendation which stated that a more stringent purification would probably be enforced where the dilution was very low, and as this was also emphasised by the chairman, it would mean that, if insisted upon, the borough (in spite of having spent a sum approaching £300,000 during the past 15 years) would be called upon to extend their present works if the Commission's recommendations were enforced.

No mention was made as to how the streams were to be gauged, and what was meant by the dry-weather flow, or who would decide the period for gauging the streams. The gauging of streams and the effluents discharged into them would involve a considerable expense: would this be borne by the local authority or by the river board?

The effluents from all the works discharged into the streams passing through the borough would comply with the standard tests suggested, but the dissolved oxygen test on the stream below the works would not come within the limiting figure mentioned in their recommendations. Would the borough then be called upon to obtain a higher standard?

He agreed that the dissolved oxygen test and suspended solids determination would be more reliable, and ultimately become more popular, than the present analytical procedure, and if he interpreted the Royal Commission's proposals rightly, their standard was something to aim at, rather than a standard to be reached by every authority.

Dr. Calvert (Wakefield) said he thought the test proposed by the Commission was likely to give different results in the hands of different chemists. He gave results obtained by various chemists in analysing the same sample of sewage effluent, and these strongly supported his contention.

Mr. E. Ardern (Manchester) stated that while the opener of the discussion did not express any definite opinion as to the desirability of fixing a statutory standard for sewage effluents, he gathered from Dr. Rideal's remarks that he was in favour of adopting a definite standard for the dissolved oxygen contents of rivers and streams, and that the duty of the Rivers Boards should be to see that the necessary purification works were constructed by the various authorities discharging into any particular river, in order that this standard of river water could be maintained.

What, however, would be the position, under this system of control, of authorities whose sewage was discharged into already polluted water courses? In some cases, *e.g.*, the river water above the effluent inlet contained no dissolved oxygen. Would the local authority so situated be allowed to postpone efficient

purification works until the authorities above stream had completed adequate works to ensure that the dissolved oxygen content of the river water did not fall below the standard ?

If so, it was evident that improvement in the condition of rivers and streams, particularly in the north of England, would be slower than under existing conditions.

He agreed that the importance of the Report lay in the fact that for the first time it was rightly proposed that the conditions of the outfall should be taken into consideration instead of judging the effluent *per se*, and, consequently, he agreed with several speakers as to the practical impossibility of fixing a definite statutory standard for sewage effluents in general. He considered that the two tests selected by the Commissioners would afford valuable information in regard to the probable effect of sewage effluent on the river into which it was discharged, although it was to be noted that the beneficial effect of the presence of nitrate in the effluent, in oxidising organic matter, would to a large extent be overlooked by these tests.

He emphasised the fact that the limits of impurity allowed by the Commissioners under these tests required a higher standard of purification than did the provisional standards at present adopted by the Rivers Boards in the North, and that the proposed limit of 2·0 parts dissolved oxygen per 100,000 absorbed in five days was much more stringent than that of 1·5 parts dissolved oxygen per 100,000 for the effluent, apart from its suspended solids, suggested by the Commissioners in their Fifth Report.

Determinations of the dissolved oxygen absorption due to suspended matter showed, that if an effluent contained as much as 3 parts per 100,000 of suspended matter, which it should be noted is 25 per cent. less than that at present allowed by the West Riding of Yorkshire Rivers Board, the total dissolved ogygen absorption of the sample would, in most cases, exceed 2·0 parts per 100,000 in five days, at 65° Fah.

THE CHAIRMAN, in closing the discussion, said he was glad to find that, although a number of minor objections to the proposed test had been brought forward the fundamental features of the Eighth Report had not been seriously attacked, except perhaps by Dr. Wilson. Dr. Rideal had regretted the absence of any bacterial test, but he (the chairman) was afraid it was impracticable to have a bacterial test of sewage. The only effective method was absolute sterilisation, and he thought they would agree, if only from the financial point of view, that that was impossible. Water authorities must be responsible for any further purification.

LT.-COL. A. S. JONES (Finchhampstead) wrote that the author appeared to complain of the view taken "by the Commissioners of their duty to make recommendations for the improvement of rivers, and only incidentally of the

improvement of effluents." By acting on that view they might have disappointed advocates of artificial systems of sewage treatment, who had been competing with each other for so many years and calling for an authoritative decision on their respective merits; but he ventured to maintain that the Commissioners had been wise and right in taking a wide view of *their duty to the public.*

The improvement of rivers had been the true objective of every Royal Commission on Sewage which had been appointed since the foul state of the rivers first forced itself upon the notice of the nation about the middle of the last century, and now, after 14 years' full investigation and consideration, the present Commission had the courage to acknowledge that gradual improvement, not perfection, of river water was all that could be obtained.

Recognising the futile litigation and disproportionate expenditure which had been entailed upon ratepayers under the law, Lord Iddesleigh's Royal Commission recommended a reasonable amendment of the 1876 Act, which might reduce those evils and, *if well administered*, cause general improvement.

The author of the paper made some demur in 1908 when the Fifth Report introduced the dissolved oxygen absorption test. He seemed now prepared to adopt the new one, if its extension from one to five days, suggested by the Eighth Report, was abandoned.

The Water Supply of Devonport, by F. W. Lillicrap, Water Engineer, Devonport.

Read at Sessional Meeting, Plymouth, March 14th, 1913.

THE history of the Devonport works dates as far back as 1793, when a Company of Promoters secured an Act to supply the town (then known as Plymouth-Dock), Stonehouse, Stoke Dameral, and the parts adjacent with water. In this Act the company were empowered to make and complete a Leat ten feet in breadth, extending from Dartmoor to the areas to be supplied, a distance of thirty-five miles; and were further invested with power to construct reservoirs, feeders, aqueducts, etc., for the proper maintenance of the supply, the proximate source of the water being the Blackabrook, Cowsic, and West Dart Rivers.

These ambitious promoters having completed the works, with pardonable gusto gave notice to the public, in March, 1800, that they were prepared to supply the inhabitants with water in the following terms:—

> "The Company of Proprietors of the Plymouth-Dock Waterworks do hereby give Notice that having, at great expense, nearly completed the laying down of Elm Pipes in most of the principal Streets of the Town of Plymouth-Dock and Stonehouse, as well as other considerable repairs and improvements of their Works, they are now ready to deliver water for the use of the inhabitants.
>
> The size of the pipe not to exceed $\frac{3}{4}$-in. Diameter, and Ballcocks to be put to the Cisterns. The Company will lay on the water for two hours every second day at farthest."

The methods of supply in those days were of a very primitive character.

In the year 1806 the company displaced certain wooden trunk mains by iron pipes, the first of the kind introduced into this country; and from this date onwards alterations and additions have been made to the works on a liberal scale, till at the present time it is believed that Devonport possesses one of the finest water supplies in the kingdom.

The population of Devonport at the last census was returned at 81,678, but the whole of this number does not come within the area of supply of the Devonport Corporation Waterworks, as a portion, viz., St. Budeaux, is supplied by the Plymouth Corporation; the number now, however, is approximately 75,800. The daily consumption, calculated on an average of twelve months, is 3,027,000 gallons per day, or an equivalent of 39·93 gallons per head per day; 23·63 gallons being for domestic purposes, and 16·30 for trade.

The area of supply is as follows:—the old Parish of Stoke Dameral, 1,760 acres; that part of the Parish of Pennycross added to the Borough in 1898, 311 acres; a part of the Parish of Pennycross outside the Borough, but adjoining thereto, 543 acres; total, 2,614 acres.

Up to the year 1893 the water company were supplying water in Stonehouse, but under authority of an Act passed in that year they sold the portion of their undertaking in Stonehouse to the Stonehouse Local Authority. In the year 1898 the Borough of Plymouth was extended, and the extension included a portion of an adjoining Parish of Weston Peverell, which the water company were supplying with water; and under the authority of that Act they sold to the Corporation of Plymouth the portion of their work in the Parish of Weston Peverell, which then was added to the Borough of Plymouth.

Source of Supply.

The gathering grounds, situated on Dartmoor near Princetown, have an area of 4,716 acres, made up as follows:—the West Dart, 1,539 acres; Cowsic, 1,524 acres; and the Blackbrook, 1,653 acres.

The average annual rainfall over the whole of the gathering grounds during the last twenty years was seventy inches. For the purpose of calculating the yield, allowing for consecutive years of drought, evaporation, and loss in floods, the available rainfall has been taken at forty-two inches, over an area, say 4,500 acres, which gives about 11,000,000 gallons per day.

This figure cannot be taken as the average daily supply, because the available quantity will be limited by the flow from the rivers on the driest day of the driest year.

The formation is granitic, but a large portion of the ground is very peaty and spongy, thus retaining the water to a great extent, and on only rare occasions has the yield fallen to less than 2,000,000 gallons per day.

In considering the proximity of cultivated land, and the possibility of impurities reaching the water, it is only necessary to say that there is but one dwelling (a small cottage) in the neighbourhood of the Blackabrook, and that at least a quarter of a mile from the river. In the other areas there are no habitations.

Leat.

The Leat was cut about the year 1800, and was thirty-five miles in length; at the same time intakes were made on the rivers West Dart, Cowsic, and Blackbrook, and the water diverted from these rivers into

the Leat, which was an open cutting, with the exception of a tunnel under Nuns Cross for a length of about 670 yards. This method of supplying Devonport was continued until about 1825,6, when a 9 inch pipe was laid from a small tank at Brooklands to Stoke, but this pipe was replaced by a 12 inch main in 1855. In the year 1876, another cast-iron main of 18 inches diameter was laid from Brooklands (hereinafter described under filters), and the Leat, as a means of a supply, was abandoned from Crown Hill to Devonport. In 1894-5, a pipe line was laid from a reservoir at Roborough to Crown Hill, and a further portion of Leat abandoned.

On the transfer of the water works in July, 1906, the Corporation, in consequence of a report made by the writer, proceeded to Parliament, and in 1907, received Royal Assent for the expenditure of £80,000 for further improving the works. In these works it was provided that a pipe line be laid from Belliver Reservoir, across the Roborough Down to Dousland, where it was intended to construct a small tank. This work was carried out, and the improvement effected enabled us to discard the Leat between the two points for purposes of supply. The abandonment of this portion was purely from sanitary motives, for the Corporation have always been keenly alive to the possibility of pollution, and their aims have been to protect the water from the source to its final distribution to the consumers. The conveyance of water, by means of the Leat, through the districts of Yelverton and Dousland was discontinued, as it was felt, from the condition of the Leat, and the number of visitors who frequent these places, that the risks of contamination from irresponsible individuals, were great.

The portion now in use is seventeen miles in length, and extends from the intakes to Dousland. Nearly the whole of the length passes through country which falls under the category of moorlands, free from cultivation.

STORAGE.

The amount of water stored at Devonport may not be considered excessive for a town supplying 75,800 persons, but in face of the excellent gathering grounds and the infrequency of days upon which the yield is insufficient to meet the demand, the writer is of opinion that the existing storage is sufficient for a number of years.

The first reservoir, named Rowden's Reservoir, was constructed at Stoke in 1825; it is circular in shape, and has a capacity of 2,071,000 gallons. A 9-in. pipe was laid to this reservoir from a tank at Brooklands.

In 1875–6 the old Crown Hill reservoir was constructed, and had a capacity of 17,000,000 gallons; its banks were raised in 1892, and the extension thus made gave an increased storage of 500,000 gallons. Another

reservoir was built at Roborough in 1896, and has a capacity of 2,049,000 gallons. The next reservoir was completed in 1900. It is situated at Beaconfield, is covered, and holds 1,163,000 gallons.

These were the reservoirs which were constructed, under the Devonport Water Company, up to 1906; when the Corporation took over the works. The storage to this date, including service reservoirs, was 22,779,000 gallons; this was considered inadequate, and in the Corporation Act, 1907, powers were obtained to construct a new reservoir at Crown Hill, having a capacity of 20,000,000 gallons. The work of constructing this reservoir was commenced in November, 1908, and completed in October, 1911, the capacity, when finished, was 21,000,000 gallons. Previous to this a small service tank was constructed at Dousland, which holds 180,000 gallons. The total storage of the Devonport Water Works is, therefore, approximately 44,000,000 gallons.

Distribution.

For the purpose of distribution, the town is divided into three districts; the High, Middle, and Low Levels. The different districts are sub-divided into smaller districts for the purpose of detecting waste, and although the detection at present is not all that might be desired, good work is being done to keep the consumption within a reasonable figure.

Filters.

The question of filtration was taken in hand at an early date by the old Water Company. By the Company's Act of 1876 they were required to provide a constant supply of filtered water, at pressure, and were under a penalty if such supply was not in operation by June, 1878. The supply was provided on this date, by means of four sand filter beds, which were laid down at Brooklands, to the design of Messrs. T. and C. Hawksley. Each bed was 1,000 square yards in area. Two further beds were constructed in 1892 at Crown Hill, and another in 1900. Under the Corporation Act, 1907, an additional bed was provided for, and this was completed in October, 1912.

There are, therefore, eight beds which are capable of filtering about 3,750,000 gallons per day.

The whole of the beds are somewhat similarly constructed, each is 115 feet long and 80 feet wide. The filtering medium is 4 ft. 6 ins. in depth, and consists of 1 ft. of 3-in. granite spalls; 6 inches 1½ in. and 6 inches ¾-in. granite stone; 6 inches of pea gravel, and 18 ins. fine sand.

The efficiency of these filters may be gathered from a consideration of a recent analysis of the Devonport water taken from a tap in the borough.

ANALYTICAL AND BACTERIOLOGICAL EXAMINATION OF WATER.

Physical Characters.

Colour, yellow tint. Turbidity, clear. Taste, natural. Odour, none. Suspended matters, none.

Analysis (stated as parts per hundred thousand).

Total solid constituents	6·7
Behaviour of solid constituents on ignition ...	moderate traces of organic matter charred.
Loss of solid constituents on ignition	0·8
Chlorine present as chlorides	1·5
Nitrogen present as nitrites	—
Nitrogen present as nitrates	trace.
Phosphates	—
Total hardness (in terms equivalent to calcium carbonate)	2·8
Temporary hardness (diminished by boiling) ...	0·9
Permanent hardness (after boiling)	1·9
Saline ammonia	0·0006
Albuminoid ammonia	0·0034
Oxygen absorbed in four hours at 80° F. ...	0·25
Oxygen absorbed immediately	—
Lead	—
Copper	—
Zinc	—
Iron	—

Bacteriological Examination.

Number of bacteria per cubic centimetre ...	17
Number of liquefying bacteria per cubic centimetre	—

It will be seen that the analytical examination is highly satisfactory, as it shows almost an absence of saline or free ammonia and a very low proportion of albuminoid ammonia, which is evidence that the water is free from pollutive matter and products of organic decay.

The results of bacteriological examination are also of a satisfactory nature, conforming to the characters of moorland water from an unpolluted watershed.

In conclusion, I venture to assert that the water works of the Devonport Corporation will compare favourably with those of any town of its size, and that the comparative freedom from waterborne epidemic disease is abundant proof of the efficacy of the filtration and other measures employed to secure purification.

Disinfectants and Disease Prevention, by W. W. WEST, Chief Sanitary Inspector, Walthamstow.

Abstract of Address to the Annual Meeting of Associates, March 18th, 1913.

AS an authoritative statement of what is considered necessary in dealing with infectious disease, I may recite the opinion of Sir Richard Thorne-Thorne, which, although specially given in relation to diphtheria, may, I think, be accepted as applying generally to other diseases.

He suggests as necessary to receive attention :—

(*a*) The separation of the sick from the healthy, including control of school attendance.

(*b*) The application to infected places and things of measures of disinfection and cleansing.

(*c*) The use of such milk only as has been boiled or otherwise cooked.

(*d*) The avoidance of infection from domestic animals.

(*e*) Such choice of residence as will secure dryness and general wholesomeness of site and surroundings, together with ample exposure to sunlight and free movement of air.

On the subject of disinfection he suggests :

(*a*) All linen, cotton, or silk articles which can be removed should be boiled for ten minutes, but exception must be made in respect of certain dyed fabrics and other special articles.

(*b*) All movable textile materials which cannot be boiled, including blankets and other woollen materials, beds, etc., should be removed and disinfected by steam.

(*c*) The remaining articles must be laid as open as possible, and the room fumigated with sulphurous acid, chlorine, or formaldehyde.

(*d*) All furniture and other movable articles must be cleansed, sprayed *or* washed, especial attention being given to cracks and corners. It is an additional safeguard to strip paper off walls, and limewash the ceiling and walls.

Disinfection is treated in legislation as a necessity, and the Local Government Board has endeavoured in various ways to secure its enforcement throughout the country; and although no special procedure is insisted upon, the most modern (or, perhaps it would not be too much to say, the most fashionable) means are favoured.

(*a*) "Disinfection, in a more restricted and accurate sense, implies the destruction of the infections produced by the micro-organisms of disease. The only means of judging whether this destruction is effectually accomplished is by actual experiment upon cultivations of known microbes, a method that has largely displaced the earlier rough process of measurement by retardation of decomposition. The mechanical means include the common process of cleansing; and, although it is specially important to observe cleanliness in the presence of infection, yet these means alone cannot be trusted for effective disinfection."

(*b*) "Disinfection by heat is the simplest and most thorough of all

> methods. With articles of small value, the safest plan is of course to burn them; but when this radical remedy is inapplicable, disinfection may *usually* be effected by exposure to moist or dry heat."

Certain text books, after describing the various forms of apparatus for disinfection by the application of steam (Washington Lyon, Goddard, Massey and Warner, Equifex, Thresh, Reck, etc.), proceed:—

> "All these fulfil the essential conditions, namely, rapidity of penetration, destruction of all organic life in the interior of bundles of moderate bulk without injury to fabrics, and, lastly, convenience in working. High pressure, intermitted, has perhaps some advantage in rapidity of disinfection of exceptionally bulky articles; but for *ordinary purposes* the simpler and less costly low-pressure apparatus is *almost equally good.*"

These statements of methods and requirements for the purpose of disinfection are taken from text books, and may be looked upon as authoritative upon the subject. I have made inquiries of a number of my friends as to the methods in use in their districts, and have obtained particulars from some forty places, which are set out in the table (page 226).

They appear at first sight to be, in the main, in accord with the statements as to what is necessary, which I have just quoted, and the last column shows the exceeding rarity of recurrence of disease after disinfection has been carried out after the expiration of the normal period of incubation.

I quote some remarks from a text book in this connection:—

> "How is it to be proved that disinfection has been effectively carried out? If the proof is to be that no cases occur within a reasonable time after the disinfection has been done, then it would seem as if one form were as good as another.
>
> "When gaseous disinfectants have been employed thorough cleansing and airing of the room must be resorted to afterwards, if only to get rid of the traces of the disinfectants.
>
> "With a liquid disinfectant, not only are the walls disinfected, but they are more or less washed down by the liquid. Moreover, since the floors also have been wetted, they will almost of necessity have to be thoroughly cleansed afterwards. If the disinfectant used has, like formalin, a powerful odour of its own, the windows of the apartment where it has been employed must be opened, and aeration in this way carried out."

Having thus glanced briefly through the points which are to be looked upon as necessary in the work of disease prevention, we may now consider what opinions are expressed, from authoritative quarters, which may give rise to doubt in our minds, on the subject of disinfection.

In pursuance of my recognition of The Royal Sanitary Institute as a means of collecting information, I have confined myself almost entirely to the proceedings recorded in its Journal as the source from

Table showing the Methods in use in various Districts.

	Method of Disinfecting.		Materials used for		Percentage of Recurrences.
	Premises.	Goods.	Fumigation.	Spraying.	
1	S. + F.	Steam.	SO_2 F.	F. or T.	rare.
2	S.	”	..	F.	·5
3	S. or F.	”	Sanitas.	F. or M.	2·5
4	F.	”	F.	..	2·0
5	F.	”	F.	..	3·0
6	F.	”	SO_2	..	2·0
7	S. + F.	”	F.	F. M. T.	nil.
8	S. or F.	”	F.	F.	nil.
9	F.	”	SO_2 F.	..	rare.
10	F.	”	SO_2 F.	..	nil.
11	S. or F.	”	F.	F.	nil.
12	S.	”	..	F. T.	nil.
13	F.	”	F.	..	2·0
14	S. or F.	”	F.	F.	rare.
15	S. or F.	”	F.	F.	1·0
16	F.	”	F.	..	negligible.
17	S. or F.	”	SO_2 F.	T.	2·0
18	F.	”	SO_2 + F.	..	nil.
19	F.	”	F.	..	1·0
20	S. or F.	”	F.	F.	nil.
21	S. or F.	”	SO_2 F.	F.	1·0
22	S. + F.	”	F.	T.	·5
23	F.	Fumigation.	SO_2 F.	..	1 in 10 years.
24	S. or F.	Steam.	F.	F. M.	·2
25	S.	”	..	F. T.	nil.
26	S. or F.	”	SO_2 F.	F.	nil.
27	S. or F.	”	F.	T.	·75
28	F.	”	SO_2	F.	1·25
29	F.	”	F.	..	·9
30	S.	”	..	F.	nil.
31	F.	”	SO_2 F.	..	nil.
32	F.	”	SO_2 F.	..	nil.
33	S.	”	..	T.	·4
34	S.	”	F.	F.	·01
35	S. + F.	”	SO_2 F.	F.	rare.
36	S. + F.	”	SO_2 F.	F.	nil.
37		“Disinfection	a factor of no	concern.”	

S.=Spraying. F.=Fumigation.

F.=Formalin.

F.=Formalin. T.=Tar derivative. M.=Mercury.

which such opinions may be obtained, and I have collected expressions of opinion on the subject of disinfection by various authors.

The summary of these expressions of opinion shows that, apart from the usefulness of heat as a disinfectant, there is an almost entire agreement amongst the authors of them that little or no reliance is placed upon the use of either gaseous or liquid disinfectants for the purpose in view, and that they might all be set aside and "cleanliness" be a sufficient substitute. Should experience lead to confirmation of these heretical opinions, a question would at once arise whether the bacteriological evidences from the laboratory (Dr. Sykes' "small scale"), having been proved unconvincing upon the "larger scale" of experience, experience having corrected experiment, in the matter of vapour and fluids, are they likely to be correct in the matter of heat? At any rate, the only method of disinfection (strictly so called) which remains to us is by heat.

Apart from heat the processes of disinfection may be divided into two, gaseous and liquid.

Of the fumigation agents, SO_2 still retains a position of prominence, notwithstanding its hoary antiquity, and the repeated assaults upon its character by advocates of more modern substances. The only dangerous opponent of sulphur fumes is formaldehyde, which may perhaps be said to have the pride of place as regards popularity. The numerous other forms of fumigation are comparatively little used, for various reasons associated with convenience of application.

I now direct attention to the table given on the opposite page. As I said, it at first appears to show efficiency of disinfection, and to support the contention for its necessity. However, a closer examination will show at least some grounds for the doubt which I have suggested we may feel upon the subject.

The results, as far as may be judged from the small percentage of recurrences, are much the same; considered in conjunction with the many other possible means of infection, they are negligible.

Yet the methods are by no means identical. Some are most complete and thorough, some appear to be purely formal and perfunctory. If the former are, as opinion has held them to be, necessary, how are we to account for the equally good results in the latter cases.

Especially do I ask attention to the opinion expressed in the case of No. 37.

Associated with that expression, I was speaking lately to a county medical officer of health, who told me that he had under his observation two districts, in one of which methods of disinfection were most thorough,

and in the other, practically nothing at all was done. He was watching them with interest, as, up to the present, he had not been able to see any way in which the former had any advantage over the latter, as regards spread of disease.

In one of my quotations, reference was made to experience in America. I now give some results quoted in the annual report of the superintendent of health for the City of Providence, N.J. He says:—"Disinfection after communicable disease in this city is not compulsory, and is only done when desired by the family." The number of recurrences after disinfection in diphtheria cases, and the rate of recurrence during the years 1902–1905 are as follows:—

Infected families, 1,457; Recurrences, 25; Rate, 1·71.

The number of recurrences and the rate of recurrence in diphtheria cases during the years 1905 to 1911, where there was no disinfection were as follows:—

Infected families, 3,000; Recurrences, 54; Rate, 1·80.

That recurrences are entirely independent of disinfection, or the lack of it, is also indicated by these facts. Indeed, these, and other studies, have quite clearly shown that these recurrences are not dependent upon germs lurking in the house, or its contents, but in some cases to germs growing in the throats of members of the family, and in others to infection acquired outside the home, the latter instances being mere coincidences.

As to scarlatina the following evidence is given. After disinfection, in the years 1904 to 1909, there were:—

Infected families, 2,408; Recurrences, 36; Rate, 1·48.

Where there was no disinfection in the years 1908 to 1911 there were:—

Infected families, 1,240; Recurrences, 20; Rate, 1·61.

The figures suggest that, as in diphtheria so in scarlet fever, recurrences after termination of isolation vary within certain limits from year to year, and have no relation to the practice of disinfection.

I leave with you the duty of judging whether I have failed to show that our doubts are justified, and that there is need for a careful observation with the view of forming a satisfactory opinion, even though it may lead to reversal of our long-cherished beliefs.

Volume XXXIV. No. 5. Issued June, 1913.

JOURNAL

OF

THE ROYAL SANITARY INSTITUTE

The Milk and Dairies Bill, by HERBERT JONES, D.P.H., Medical Officer of Health, Herefordshire Combined District (FELLOW).

Read at Sessional Meeting, London, Tuesday, March 11th, 1913.

THE production and distribution of milk in England and Wales is regulated by the Dairies, Cowsheds, and Milkshops Orders of 1885, 1886, and 1899. The earliest Order was made by the Privy Council under section 34 of the Contagious Diseases (Animals) Act, 1878. The later two Orders were made by the Local Government Board under section 9 of the Contagious Diseases (Animals) Act, 1886, which transferred the powers of the Privy Conncil under the 1878 Act to the Local Government Board. An Order, which was revoked in 1885, was made by the Privy Council in 1879.

The Order of 1885 provides for the registration by a local authority of a person carrying on the trade of cowkeeper, dairyman, or purveyor of milk, and for the giving notice by the local authority of the necessity of registration. A person who carries on such trade for the purpose only of making and selling butter or cheese, and who is not a purveyor of milk, and a person who sells milk from his own cows in small quantities to his workmen or neighbours for their accommodation *need not be registered.* It is important to notice that these exceptions apply solely to registration, and not to the other requirements of the Order, which include the following :—

A month's notice in writing must be given by a dairyman to the local authority of intention to occupy a dairy or cowshed not previously so occupied.

A building must not be occupied after June 15th, 1885, as a dairy or cowshed, unless the local authority is satisfied with the lighting, ventilation, air space, cleanliness, drainage, and water supply of the building.

No building must be occupied as a dairy or cowshed unless the lighting, ventilation, air space, cleanliness, drainage, and water supply are such as are necessary and proper for the health and good condition of the cattle, for the cleanliness of milk vessels, and for the protection of milk against infection or contaminaton.

No person while himself suffering from, or having recently been in contact with any person suffering from, a dangerous infectious disease, must milk cows or handle vessels used for containing milk for sale, or in any way take part in the conduct of the trade or business as far as regards the production, distribution, or storage of milk.

A milk store or milk shop which has communicating with it a water-closet, earth-closet, privy, cess-pool, or urinal must not be used for the storage of milk after the attention of the occupier has been called to their proximity.

A milk store or milk shop must not be occupied as a sleeping apartment.

Swine must not be kept in a cowshed or where milk is stored.

Milk from a diseased cow must not be mixed with other milk, or sold or used for human food, or (unless it has been boiled) sold, or used for food of swine or other animals.

The Order of 1889 defined the expression "diseased cow" as including a cow which had been certified by a veterinary surgeon to be suffering from tubercular disease of the udder.

The amending Order of 1886 provided for the infliction of penalties against any person guilty of an offence against the 1885 Order.

Excluding special powers obtained by about 100 local authorities (including those in London), and excluding the powers conferred by the Sale of Food and Drugs Act, the above are all the powers possessed by local authorities in England and Wales for the control of the milk supply.

Further powers may be obtained by adopting the Infectious Disease (Prevention) Act, 1890. Section 4 of that Act provides that a local authority may, on the advice of the medical officer of health, who must be assisted in his enquiries by a veterinary surgeon, prohibit for a specified period the sale of milk within or without the district. Up to the 31st March, 1912, 730 urban and 334 rural authorities had adopted the whole or particular sections of this Act.

Still further powers are obtainable by making regulations under the Dairies, Cowsheds, and Milkshops Order, 1885. These regulations may be:—

(*a*) For the inspection of cattle in dairies.

(*b*) For prescribing and regulating the lighting, ventilating, cleansing, drainage, and water supply of dairies and cowsheds in the occupation of persons following the trade of cowkeepers or dairymen.

(*c*) For securing the cleanliness of milk-stores, milkshops, and of milk-vessels used for containing milk for sale by such persons.

(*d*) For prescribing precautions to be taken by purveyors of milk and persons selling milk by retail against infection or contamination.

In the latest Annual Report of the Local Government Board (1911-1912) it is stated that there were 58 urban and 61 rural districts without such regulations. At the census of 1911 there were 1,136 urban (excluding London) and 657 rural districts in England and Wales.

It is a matter of some surprise that although local authorities were empowered as long ago as 1885 to make regulations, it was not until 1899 that any model regulations for the guidance of the authorities were issued by the Local Government Board. One of the reasons for this delay given by the Board to a deputation from the Royal Agricultural Society of England in 1897 was the desirability of awaiting the issue of the Report of the Royal Commission on Tuberculosis.

I have thought it desirable to sketch the existing powers with respect to milk supplies, in order that we may the better understand how far they are altered or extended by the Milk and Dairies Bill introduced by Mr. Burns last session, and which applies only to England and Wales.

At present the dairyman alone is required to be registered, but under the Bill not only the dairyman but the dairy must be registered by the local authority, who may refuse to register the dairy, or remove it from the register, if the premises are unsuitable for the purposes of a dairying business, or are in such a state as to be a nuisance, or do not comply with the provisions of the Bill or of Orders made under it. It would be much easier to administer this clause of the Bill if, following the precedent of section 29 of the Public Health Acts Amendment Act, 1890, with respect to slaughter-houses, registration were made, or license granted, for a specified time, not less than twelve months. It is much easier to refuse to renew registration than it is to remove from the register.

Where regulations are now in force the medical officer of health, or

the inspector of nuisances, or any other specially authorised officer of the local authority, has power of entry for the purpose of inspecting cattle, but under the Bill this power is limited to the medical officer of health, and then only if he is accompanied by a veterinary surgeon. If this proviso were to be strictly acted upon it would mean that the medical officer of health could not make even a preliminary examination of a cow for the purpose of deciding whether he should call in the more expert services of a veterinary surgeon.

For the purpose of inspecting the dairy and those employed in it the medical officer of health is the only official to whom power of entry is given by the Bill. The precedent of the Housing (Inspection of District) Regulations, 1910, might be followed, and power of entry given to an officer designated by the local authority, but acting under the direction and supervision of the medical officer of health.

Section 4 of the Infectious Disease (Prevention) Act, 1890, to which reference has already been made, and which gives power to a local authority to prohibit the sale of milk, is repealed by the Bill. It is replaced by Clause 2 (2), which is of sufficient importance to warrant its quotation.

> If the milk from any dairy situate without the district of any sanitary authority is being sold or used for human consumption within the district, and the medical officer of health of that authority (hereinafter referred to as the notifying authority) has evidence that infectious disease is caused, or is likely to be caused, by consumption of the milk supplied from the dairy, he shall forthwith give notice *if the dairy is situate in a rural district to the Council of the county in which the district is situate, and in other cases to the Council of the district in which the dairy is situated, and the Council to whom notice is given* shall forthwith cause the dairy, and the persons employed therein, and the cattle therein to be inspected by their medical officer of health, who, for the purpose of the inspection of the cattle, shall be accompanied by a veterinary inspector, or some other properly qualified veterinary surgeon. Sufficient notice of the time of the inspection shall be previously given to the notifying authority to allow of the medical officer of that authority, or any veterinary inspector or other properly qualified veterinary surgeon, being present at the inspection if that authority so desire.

This procedure appears to me to be unnecessarily cumbersome, and in the case of combined districts in which one medical officer of health is employed, it would lead to delays which might have serious results. The procedure would be far better if it were as follows. The words in italics replace those italicised in the clause as it appears in the Bill given above:

> *to the medical officer of health of the district in which the dairy is situate, and to the medical officer of health of the county in which such dairy is situated, and the council of the district in which such dairy is situated shall forthwith*

In the course of his inspection made under the powers given in clause 2

(2) the medical officer of health is empowered to require a cow to be milked in his presence, and to take samples of the milk if he has reason to suspect that a particular cow is suffering from tuberculosis with emaciation, or from tuberculous udder, or is giving tuberculous milk. Dairymen and other persons employed in the dairy are required to give assistance to the medical officer of health or veterinary surgeon, and may be fined up to five pounds for refusing such assistance or for obstructing those officers.

Having come to the conclusion that infectious disease is caused, or is likely to be caused, by the milk from a dairy under inspection, the medical officer of health is required to report to the authority by whom he was appointed, as well as to the Local Government Board and to the Board of Agriculture and Fisheries, and his report must be accompanied by any report furnished to him by a veterinary surgeon. If the medical officer of health considers the case to be one of urgency he may do one of three things: he may agree with the dairyman on agreed terms to stop the supply of milk from the dairy or from any particular cow; or he may make an interim order prohibiting the supply of milk for human consumption in any way, either from the dairy or from a particular cow, for a period not exceeding ten days, either absolutely or unless certain prescribed conditions are complied with; or he may refer the matter to the local authority, who, pending their final decision, may make such an interim agreement or order as the medical officer of health could have made.

A particular supply of milk having been prohibited in the manner related, the local authority, or a committee appointed by it, and to which the powers of the authority under the Bill have been delegated, having received a report of the circumstances from the medical officer of health, the dairyman may be given not less than twenty-four hours' notice to appear before the authority, or the committee, to show cause why a more prolonged and apparently unlimited prohibition Order should not be made with respect to the milk supply in question. If the dairyman fails to show cause why such an Order should not be made, the authority or committee may make a prohibition order. If no Order is made the reasonable expenses of the dairyman in attending may be paid by the authorities. Disobedience to interim or other Orders renders the dairyman liable to a maximum fine of £5, but it is expressly stipulated that he shall not be liable to an action for breach of contract if the breach is due to either of these Orders. A medical officer of health may withdraw an interim Order which he has made, or, if so authorised by the authority he may withdraw an Order made by the authority.

An appeal may be made by a dairyman who considers he is aggrieved

by a prohibition Order to a court of summary jurisdiction, who may confirm, vary, or withdraw the Order; and the same court may decide whether an Order has been made unreasonably, in which case the dairyman may recover from the authority full compensation for any loss or damage he has sustained. Any dispute as to the fact of damage, or the amount of compensation is to be determined in accordance with the arbitration sections (308, 179, and 180) of the Public Health Act, 1875. The use and the misuse which has been made of these sections in the case of meat seizures does not lead to a very hopeful anticipation that they will be any more effective in the case of dairies. It is a pity that some less costly and irritating procedure could not be devised. I must express regret that there is no provision in the Bill for enabling a medical officer of health to exclude a particular supply of milk from his district.

The powers given by the Bill to rural district councils and with their consent to urban district councils, and to the medical officers of health of those districts, may be exercised concurrently by the county council and by the medical officer of health of a county respectively. It is to be regretted that this concurrent power should be given unprovisionally. It might very well have been imposed in those cases in which the local authorities in question had been shown to be negligent of their duties. Dual control is always to be deprecated, and is never productive of the best results.

A most important clause (12) renders any person, whether a dairyman or not, liable to a maximum fine of £10 if he sells or offers for sale for human consumption in any form the milk of a cow which has within six months to his knowledge given tuberculous milk, or which is suffering from tuberculosis of the udder, or which is emaciated from tuberculosis.

Another excellent provision is that which empowers an inspector of the Local Government Board, or a medical officer of health, or any person authorised by these officials, to take for examination samples of milk at any time before it is delivered to the consumer. If such samples, however, are used for the purpose of proceedings under the Food and Drugs Acts, the requirements of those Acts must be complied with, and a medical officer of health must not take a sample outside his own district.

Reference has already been made to the services of veterinary surgeons in the administration of the Bill; it is only proper, therefore, that provision should have been made for the appointment of veterinary inspectors. These appointments may be required by the Local Government Board so far as county, borough, or urban districts are concerned. This require-

ment might be extended to include large rural districts or combinations of rural or of urban and rural districts.

The Bill makes it no longer optional with local authorities to make regulations, but empowers the Local Government Board, after consultation with the Board of Agriculture and Fisheries, to do so.

In addition to those matters concerning which regulations may now be made by local authorities, the Local Government Board may make them with respect to the registration duties of the authorities; to the measures to be taken for the cooling of milk; to the prohibition and regulation of the use of colouring matter and of skimmed or separated milk; to the manner of conveyance of milk and the identification of churns used for its conveyance; to the marking of the receptacles of milk for sale for human consumption where it is not sold in its natural state; to the giving of assistance and information between sanitary authorities and county councils; to the forms of notices to be used, to the authorities by whom orders are to be executed and enforced, and to the powers of entry and inspection exercisable by the authorities and their officers.

The Local Government Board is also empowered to make regulations under the Public Health (Regulations as to Food) Act, 1907, for the prevention of danger arising to public health from the importation of milk intended for sale for human consumption.

An irritating defect in the Sale of Food and Drugs Acts has been remedied by clause 16, which provides that a warranty or invoice shall not be available as a defence to any proceedings under the Food and Drugs Act of 1875 where the article in respect of which the proceedings are taken is milk.

In the Milk and Dairies Bill which Mr. Burns introduced into the House of Commons on May 25th, 1909, and of which the Bill now under review may be said to be an enlarged edition, power was given to certain urban districts to establish and maintain depots for the sale of milk specially prepared for children under two years of age. The present Bill contains the same provisions, and enables the Local Government Board to make regulations with respect to the establishing and carrying on of such institutions. Had the 1909 Bill become law it is probable that advantage would have been freely taken of these powers, but in the period that has elapsed, the views of public health administrators have undergone considerable change with regard to their usefulness, and we are becoming more and more convinced that the lives of young children can best be saved through their mothers.

Section 53 of the Public Health Acts Amendment Act, 1907, which

is an adoptive Act, enables a local authority under certain circumstances to require a dairyman, upon payment to him, to furnish the medical officer of health with a complete list of the farms, dairies, or places from which he derives his supply of milk. The Bill makes this section apply to London, but it should certainly have been made to apply to the whole country, for its usefulness to an administrative officer can hardly be exaggerated.

I have ventured to suggest how the latest Milk and Dairies Bill might be amended and improved, but my chief criticism I have kept to the last. It is not too much to say that the responsibilities of the medical officers of health in rural districts are increased in this measure more than in any other legislative enactment of recent years. The very first clause imposes the responsibility upon them of deciding whether dairy premises shall be used as such. It may rest with them to say whether or not some member of the very authority by whom they have been elected shall carry on his business in the same unsatisfactory manner in which it may have been conducted for years past to the detriment possibly of the public health. Unless the medical officer of health is placed in such a position that he can give fearless advice and press that advice home without any thought of untoward consequences to himself the Bill will be a dead letter, and the time of Parliament will be wasted in discussing it. The inclusion of a clause giving to all medical officers of health the same security of tenure as that which was given in the Housing, Town Planning, etc., Act, 1909, to medical officers of health of counties, and which the Irish, Scottish, and Metropolitan medical officers of health have had for many years, would ensure the carrying out of the Bill when it becomes an Act in a manner which would more than satisfy the hopes and desires of its promoters. Without such a clause there will still be the same tale to tell of dirty cowsheds, of dark unventilated dilapidated buildings, of cows trailing their udders through manurial accumulations, of lack of water supplies, of unwashed milkers, and of filth-caked udders and flanks.

Dr. A. G. R. Cameron (West Sussex) said the immediate effect of the passing of the Milk and Dairies Bill would be to officially bring into line those sanitary authorities who up to the present had failed to make regulations with respect to dairies, cowsheds, and milkshops. Regulations would be made for them, as provided for in clause 13 of the Bill, but it remained to be seen whether these would be enforced.

Clause 2 (2) would also give sanitary authorities certain powers, which to some extent were already provided for in section 4 of the Infectious Disease Prevention Act, 1890. Under clause 2, however, the medical officer of health

of the district in which the infected milk was distributed, was not empowered, as in the case of the Prevention Act, to inspect the infected dairy or farm, or to otherwise investigate the outbreak at its source, independently of the local medical officer of health, as was now frequently done.

He agreed with Dr. Jones's amendment, which was to the effect that the notice of such outbreaks should in all cases be sent to the medical officer of health of the district in which the farm or dairy was situated, whether urban or rural, and that medical officers of rural districts and their sanitary authorities should be allowed to investigate the alleged outbreak, and, if necessary, exercise the same powers as provided for in the case of urban districts.

The Bill, if it became an Act of Parliament, should be administered either entirely by the county councils, or should be left to the several urban and rural sanitary authorities.

In respect of the procedure which had to be followed in dealing with tuberculosis, he thought it a mistake to include this disease with the other infectious diseases.

One of the most disappointing features of the Bill was that no definite provision was made for the systematic examination of cows. The Local Government Board might make regulations for their inspection, and under section 14 they might require county councils, borough councils, and urban authorities to appoint veterinary inspectors; but it was doubtful whether the inspectors so appointed would be required to make systematic inspections or whether they would only be called in to inspect in special cases. Sanitary authorities and county councils may take samples of milk, and under the Tuberculosis Order of the Board of Agriculture, cases of tuberculosis of the udder and tuberculosis with emaciation had to be notified, but bacteriological examination as a means of stamping out tuberculosis in cattle was of limited value, and the occasional notification of a chronic case of tuberculous disease was not likely to materially decrease the prevalence of the disease.

The Bill had some important and useful provisions, and much would depend upon the regulations to be issued by the Local Government Board and upon their enforcement, but as a means of preventing the sale of tuberculous milk it would have very little effect unless the inspection of dairy farms was systematically carried out.

MR. CECIL REVIS (London) said that while he agreed with the general purpose and principles of the Bill, he thought the methods by which its ends were to be achieved were open to question. For instance, nothing was of greater importance than farm inspection; in fact, if the Bill had provided for this alone an immense step forward would have been made; but, at the same time, there was not at the moment any class of man purposely qualified for this work, and without this provision, inspection would not be efficient and would probably be irritating. He was of the opinion that the medical officer of health

was not, and could not be, really qualified for that work, and that a special officer should be trained who should have a veterinary and not a medical basis.

With regard to tuberculosis, in view of the opinion, which was steadily gaining ground, that the amount of human consumption spread by milk was a negligible quantity, it was of greater importance to the farmer that an attempt should be made to lessen tuberculosis amongst cattle from the point of view of damage to his stock, than it was to the general public. The recent order of the Board of Agriculture would do all that could be done, and it was a great mistake that the risk should be run of a large part of our milk supply being cut off as a result of examinations of the milk as it arrived in towns. For this reason he was strongly of opinion that the word "tuberculosis" should be eliminated from the clause which defined "infectious diseases." If that were done, the operations under the order of the Board of Agriculture would not be interfered with.

There was no doubt that clause 15 contained within itself the germs of the greatest good or the greatest evil. If it were left to the Local Government Board to make any regulations regarding the delicate matters dealt with in that clause without any control, there would not be the least doubt but that much friction and probably ridiculous regulations would result. The recent Milk and Cream Regulations were an excellent illustration of this. The clause might be made of the greatest value if a section were inserted in the clause, compelling the Local Government Board to appoint an Advisory Committee, of which half the members should be representative of the Dairy Farmers' Associations and of the Dairy Trade, on whose recommendations these regulations should be drawn up, and without whose sanction they should not have the force of law.

Mr. F. E. Fremantle (Hertford) said the last speaker had expressed his disbelief in the danger of tuberculous milk to the national health. He was the champion of a lost cause. For practical purposes it was proved by the Royal Commission, acknowledged by the International Conference at Washington, confirmed by official and unofficial investigations and reports from the United States and the Continent, and accepted by all leading authorities of the day, that the widespread tuberculosis of cattle was a leading cause of the widespread tuberculous infection of children, and a not improbable cause of much eventual tuberculosis in adults. This was sufficient for their purpose. Action could not wait for complete and absolute scientific proof; it must act on a 90 per cent. probability.

The discussion had a practical end in view, the support or the rejection of the Milk and Dairies Bill, 1913. With the Bill must be considered the proposed Order of the Board of Agriculture, under the Diseases of Animals Act, 1894, providing for compensation in case of slaughter; and the promise of the Treasury to pay one half of the compensation. These were vital to the scheme of the Bill. The Bill was admittedly a compromise between those who proposed and those who opposed former Bills; logically it admitted amendments; practically,

as a compromise, it admitted no material amendment. As a whole, was it in the interests of the public health or not? The reply was undoubtedly "Yes." It was accepted by the interests mostly concerned in its finance: the farmers on the one hand and the county councils and the Treasury on the other; its general result must therefore be the material reduction of tubercle in cattle and so in the human community.

Certain improvements might be discussed for the Committee-stage of the Bill. It was difficult to prevent the sale of cows that were suspect and that could not be dealt with until the suspicion was confirmed. It would seem appropriate, therefore, to suggest that the proposed regulations under clause 15 should stipulate the branding of all milch-kine whose milk was sold for public consumption. It should also be made an offence to sell a cow under suspicion without notifying the fact to the purchaser. Compensation for diseased cattle should be paid only when the sheds were healthy.

All medical officers of health would strongly endorse Dr. Herbert Jones's demand for a terminate annual license of dairies, instead of interminate registration. Every dairy would thus come up for periodic review, and on the dairyman would fall the burden of proving the healthiness of his dairy, his cows, and his methods.

It appeared that the powers of inspection of cattle given in the Bill would not be available to sanitary inspectors, who in practice inspected the dairies. Where, therefore, the county officials inspected the dairies under the Act, there would be a certain duality of inspection and control. That required serious consideration; but it was probably best, by giving concurrent powers both to district and county authorities as the Bill proposed, to allow a natural solution to take place of the relative functions of the county and district authorities, as might be best suited to each area. It was to be noted that the profession of veterinary surgeon was being further established, and it was to be hoped that the position of this official in the public health service and his training might be assured on lines appropriate to the part he should play in public health work. This part was likely in the future to be of very great importance and value.

Hitherto the big cities have had the right of inspecting the source of their milk supply in the counties. But it was obviously wrong that health authorities, whether district or county councils, should be relieved of any sanitary functions in their own areas. This was the principle adopted by the Bill; the responsibility for export as well as for home consumption was thrown on the local authorities; and the improvement should be considerable if the slower authorities were kept up to the mark by public opinion and by the powers of the Bill.

MR. G. TITUS BARHAM (Sudbury Park), speaking on behalf of the dairy trade, said that in his opinion the present Milk Bill was a great improvement on its predecessors. It was, however, a most serious matter that the regulations under so many different headings would have to be prepared hereafter by the Board

of Trade, and the more important of the conditions which would affect the production and supply of milk would come within the scope of those regulations. He was afraid that those regulations would result in a large decrease in the supply of milk, for the reason that many farms where the milk was now produced would be found unsuitable, while in other cases the gentry and tenant farmers would not care to be supervised and regulated, and instead would prefer to devote their attention to one of the other departments of farming, especially now that the position of agriculture generally was improved from the conditions that were in existence when the production of milk was more developed. The cost of milk production had during the last few years increased considerably, and any addition to the cost must result in a rise in the retail prices.

Dr. J. S. Tew (Tonbridge) agreed with the objects of the Bill, but considered there were a great many alterations required before it could be workable. The distinction made between the powers given in urban and in rural districts was invidious. "Urban" and "Rural" by no means always indicated the character of a district. If necessary no objection would be made to a certain amount of supervision by the county council over matters concerning milk, but dual control of the kind apparently proposed would not work smoothly.

In the Bill no mention was made of the inspectors of nuisances, who had done excellent work in the past with regard to dairies and cowsheds, and who were generally familiar with the conditions of the cowsheds throughout their districts.

It could not be supposed that the best work could be done while many sanitary inspectors and medical officers of health were appointed for short periods by the very persons whose premises and produce they frequently had to report on adversely. It was more important that the executive officers should have security of tenure given them than with medical officers of counties whose work was mainly administrative.

The annual licensing of dairies and cowsheds in the same manner as slaughter-houses would give sanitary authorities more control over the premises, and would necessitate a report of the conditions prior to renewal of license.

With regard to rural districts, why should they not be able to appoint a veterinary surgeon? Such appointment was generally more necessary in a rural district. It appeared quite unnecessary for the medical officer of health on *all* occasions of inspection of cattle to be accompanied by a veterinary surgeon.

The worst part of present procedure was that if a tuberculous cow was found in market or by tuberculin test, or by bacteriological examination of the milk, little or nothing could be done; the milk supply might certainly be locally stopped, but the cow was "got rid of," *i.e.*, usually sold to some other district to be again milked if it gave a fair quantity.

No remuneration was proposed for the extra travelling in regard to action required under this Bill, which might be very considerable.

DR. RALPH VINCENT (Infants' Hospital, Westminster) said the Infants' Hospital obtained its milk from its own farm (Combe Bank Farm, Brasted). The procedures at the farm were supervised by a Board of Control.

Everything was done to produce a pure milk. The milking was carried out under strict precautions, and the milk was reduced to 40° F. immediately after milking, by means of refrigerating machinery.

It was transported to the hospital in insulated churns, which prevented any serious rise of temperature during the journey.*

In the research laboratory of the hospital the milk was systematically examined chemically and bacteriologically. The milk was so pure that when insulated at a constant temperature of 67° F. (day and night), the average time of curdling considerably exceeded seventy-two hours. Not infrequently, the milk does not curdle for four or five days.

Every cow had to pass the tuberculin test, and in the farmers' own interests everything should be done to eliminate tuberculosis as speedily as practicable; but it was a great mistake to suppose that any serious amount of tuberculosis in human beings was contracted from the cow. Tuberculosis in human beings was contracted by human beings from human beings, and certainly not from the cow. To suppose that the comparatively few tubercle bacilli found in a mixed milk supply were capable of causing tuberculosis was opposed to everything they knew of the action of bacteria in the alimentary tract.

It had been demonstrated at the Combe Bank Farm that the production of pure milk was not expensive. Any increased expenses were more than repaid by the absence of the serious losses that the ordinary farmer sustained by reason of his carelessness and ignorance. The statement that pure milk could not be sold at a price less than 8d. per quart was unjustified. The pure milk produced at the hospital farm costs the hospital less than 3d. per quart delivered at the hospital.

MR. CHARLES BATHURST, M.P. (South Wilts), said that the final report of the Royal Commission on Tuberculosis was to him one of the most unconvincing documents that had ever found its way into a blue cover. During the last few years human tuberculosis had greatly decreased, while tuberculosis in cows had been on the increase, and milk had been much more generally consumed. Dirt was a far more serious cause of complaint than disease. There was a greater danger of increasing tuberculosis by limiting the milk supply than by supplying milk that contained a few *bovine* tuberculous germs. It was well to remember that some 35 per cent. of the cows in this country would react to tuberculin, and by a too rigid enforcement of the Bill milk might easily become the luxury of the rich, and by its very scarcity and consequent non-consumption create a predisposition to human tuberculosis which would not otherwise occur.

* For a detailed description of the farm, with illustrations, see the "Nutrition of the Infant." 4th Edition. London, 1913.

Miss Edith Maynard (Beckenham) drew attention to the fact that in the Bill no special attention had been drawn to the necessity for *clean* milk, but that, if it came into force, it would still be permissible to sell milk which was contaminated with manure and pus.

Although much had been said that evening about the still debatable subject of the transmission of tuberculosis through milk, yet no one had referred to the indisputable fact that a very much larger number of infants died from diarrhœa due to *dirty* milk than from tuberculosis.

Mr. Sidney Hole (Hassocks), speaking as a dairy farmer, desired to assure the meeting that the principles for which those present and the authors of the Bill were in the main contending, were not opposed by the great body of dairy farmers and stock owners. On the contrary, he ventured to voice the oft-expressed view of a large dairy farmers' association with which he had been closely connected for some twenty years, that it was greatly to their moral and material interest to encourage and welcome sound legislation on the question.

As matters now stood, dairy farmers were in this position in the vast majority of cases: they purchased their animals in good faith; in their own interests they would certainly not buy disease knowingly, but they did buy it latent in both young and mature live stock. It was present more or less in every available source of supply open to them; tens of thousands of Irish cows were bought and must continue to be bought, a large percentage of which ultimately developed the disease, and there was no infallible means of detecting it until it was obviously there, when the farmer was confronted with the alternative of continued use, or rather misuse, and heavy loss. The man so placed could only be made responsible by guaranteeing to him adequate compensation, sufficient to secure his wholehearted co-operation in detecting and eliminating every such case before it arrived at a condition fraught with danger to the public and to himself by contaminating other animals, greatly increasing the cost, and perpetuating the disease.

He thought greater wisdom and sense of proportion, to say nothing of justice, would be shown in allocating some sensible proportion of the millions voted to be spent on sanatoria for the treatment and cure (?) of the disease towards its prevention. Evidently statesmen in high places believed that a pennyworth of prevention was worth a pound's worth of cure, and were determined they should only have the penny.

Milk and Dairies Bill, by George Reid, M.D., D.P.H., Medical Officer of Health, Staffordshire County Council.

Read at Sessional Meeting, Stafford, April 25th, 1913.

I OFFER no apology for bringing the question of the Milk and Dairies Bill before the Institute, notwithstanding the fact that it formed the subject of discussion at the last sessional meeting. The question is of such vital importance from a public health point of view, and public health officers have so long been crying out for reform both in the law governing the milk supply and its administration, that at this critical moment it is more than ever the duty of those who know to bring home to those who do not know why, hitherto, our efforts to insure that one of the most valuable of our food supplies (perhaps the most valuable so far as children are concerned) shall be delivered to the public in a clean and wholesome state have lamentably failed.

Before dealing with the remedies, let us consider what are the evils we wish to get rid of.

In the first place it is essential that the milking process shall be conducted under wholesome conditions, by clean people, and in clean places. We must no longer be satisfied with a milk supply which is grossly contaminated with cow dung and other extraneous pollutions, with the result that what should be the cleanest article of diet is, as a fact, rendered the dirtiest through ignorant disregard of cleanly methods in its production, to put the best complexion upon it, by the average milk producer. I can testify from long and wide experience that Dr. Herbert Jones did not exaggerate in describing the conditions as usually met with, namely, cows with already filth-caked udders and flanks trailing their udders through manurial accumulations and being milked by unwashed milkers. It is not difficult to imagine what takes place under these circumstances; no amount of straining through muslin will remove such filth from milk, the larger particles may thus be held back, but all the soluble and semi-soluble pollution remains, together with swarms of putrefactive organisms, and, what is more important, disease organisms from the excreta and other discharges of tuberculous animals. This disgusting pollution could undoubtedly be prevented, even under the existing law, by the strict enforcement of properly framed regulations, but hitherto the greatest laxity has prevailed, and, in the majority of cases, for all practical purposes, the Dairies, Cowsheds, and Milkshops Order might as well never have been drafted. No doubt the public are largely to blame for this;

had they demanded a clean milk supply it would have been provided, but, apparently, in their ignorance they have accepted the present order of things as being inevitable. Tradition had it that although cows were undoubtedly kept under dirty conditions the dirt was clean dirt and it did not much matter. The milk producer, on the other hand, having no incentive towards the adoption of cleanly methods, and being as a rule left severely alone by the authorities whose duty it was to enforce the law, continued to conduct his business as his forefathers conducted it; the lowest class labourer was thought good enough to be employed as cowman and milker; where cows are there must be dirt, and there was an end of it. It has often struck me as remarkable how tradition influences conduct in the business of milk production. For example, when the milk is once handed to the dairy woman an entire change of procedure follows. As a rule it is placed in a scrupulously clean apartment, the impervious floor of which is swilled with clean water several times daily, the walls are spick-and-span from the whitest of whitewash, and the utensils are apparently (although not always actually) scrupulously clean. In short, when the woman comes upon the scene tradition tends towards cleanliness, although she seems to be in happy ignorance of the fact that the mischief is already done and is past remedying. Here let me suggest that milking is not a man's job; how the practice ever came to be introduced into England I cannot imagine. I should like to see the expression of a farm labourer in Scotland if he were asked to milk a cow!

Another source of danger is the further contamination of the milk during its distribution and while it is being temporarily stored in milk-shops. These risks, however, are more readily amenable to correction by efficient inspection under the existing law, although I must say that there is not much incentive to energy in this direction knowing that the milk has, previous to this stage, been so seriously damaged.

As regards the risk that milk may be specifically contaminated by being handled by persons suffering from infectious diseases, such as scarlet fever, diphtheria, and enteric fever, it is a risk which cannot be altogether avoided, and, on the whole, the powers now possessed by sanitary authorities meet the case as far as it can be met, and it is only fair to say that as a rule milk producers, serious though the consequences frequently are to them, willingly give every assistance to public health officers in their efforts to cope with such occurrences.

There yet remains one risk associated with our milk supply which, as regards injury, far exceeds those already referred to. The question whether human beings can contract tuberculosis from a bovine source has

once and for all been answered in the affirmative after a most exhaustive inquiry by a Royal Commission. It has also been established that the chief source of risk of such an occurrence is the consumption of tuberculous milk, and having regard to the fact that milk is such an important constituent of children's diet, and that the bovine type of tuberculosis is almost certainly that type to which children are peculiarly liable, to leave any stone unturned in our endeavours to combat this evil would amount to a crime.

So much then for the evils which have to be remedied; let us now consider whether the Bill which is the subject for discussion is likely to fulfil its purpose should it become law as it is now drafted. Together with the Bill must also be considered the recent Tuberculosis Order of the Board of Agriculture and Fisheries, which comes into operation six days hence.

Speaking generally, I do not think that there is much fault to be found with the powers contained in the Bill, taking it for granted that the Regulations framed under it will be wisely drafted, setting forth more specifically than has been done in regulations drafted under the Dairies, Cowsheds, and Milkshops Order the minimum requirements as regards premises, and the essential observances in the conduct of the business.

But, no matter how perfectly, on paper, the clauses of the Bill and the Regulations may appear to fulfil requirements, as in the past so in the future both will be futile unless the authorities to whom the administration is entrusted fearlessly and efficiently enforce their observance. Let us see whether we may reasonably look for such efficiency.

Section 1 of the Bill provides for the registration not only of dairies but of dairymen, and, further, it provides for the imposition of fines if the dairy business is not properly conducted; and, even what is still more valuable, the cancelling of the certificate of registration. It is obvious that such powers, with properly framed regulations, would be most valuable if properly enforced, but will they be enforced? I doubt it. In the first place, the responsible authorities are the district councils, the bodies who have entirely failed us in the past. Moreover, who is to advise these authorities, composed in the case of rural districts, where the bulk of the milk supply is produced, very largely of dairy farmers? Why, the district medical officer of health, who retains his appointment from year to year only if it so pleases his authority. I do not envy him his position!

Section 2 provides for the inspection of dairies by the medical officer of health (or an officer of the sanitary authority acting under his instructions), but this hindrance is placed upon him, he may not examine the

source of the milk, namely, the cows, unless he is accompanied by a veterinary inspector.

Sub-section (2) of section 2 provides for the inspection of dairies by medical officers of health, and, if accompanied by a veterinary inspector, of cows also, in the case of urban but not of rural districts, on notice being received from the medical officer of health of another district who has reason to believe that infectious disease has been caused, or is likely to be caused, by the consumption of milk sent into his district from the district in question. Here the rural district is left out, and the county medical officer is made responsible for this particular inspection, for it is to him that all such notices have to be sent if the dairies concerned are situated in rural districts. I fail to see, if rural district councils are to be authorities under the Act, why they should not have these powers also.

Sections 3 to 10 inclusive give very valuable powers to the authorities and modified powers to medical officers of health to prohibit the sale of milk from any particular dairy or any particular cow therein if, in the opinion of the medical officer of health, infectious disease is likely to be caused by consumption of the milk. The medical officer of health in such a case may agree with the dairyman regarding any restrictions to be observed, or he may make an interim restraining Order for any period he may think fit not exceeding ten days, or until such conditions as he may prescribe in the Order are complied with. This power will have to be exercised with great discretion, because the dairyman, if aggrieved, may appeal to a court of summary jurisdiction, and if the court comes to the conclusion that the Order, whether made by the medical officer of health or the authority, was made without due cause, may withdraw it, and the dairyman in that event may recover from the authority full compensation for any damage or loss he has sustained.

Section 11 is an important one, for it gives concurrent powers to county councils and county medical officers to administer the Act in rural districts, and, with the consent of urban district councils, in urban districts also.

I do not think it is likely that county councils will avail themselves of their powers. In the first place divided responsibility is always a mistake, and, in view of the increasing work which county councils are being called upon to undertake, with attendant increasing expenditure, one cannot be surprised if they hesitate before undertaking further work of a voluntary character. It would be a very different matter if the Bill were amended, and county councils and the councils of county boroughs only were made responsible for its administration. In that event, the

work would, I am satisfied, be well done, there would be no overlapping, and uniformity of procedure would be secured. Even as the Bill is now drafted it is conceivable that rural and urban district councils in administrative counties might agree to sink their powers on the understanding that county councils would undertake the work, but it must be the whole or nothing, and every authority in an administrative county must come under the arrangement. I do not for a moment think it likely that district councils would agree to such a proposal, but if the Bill becomes an Act in its present form, both efficiency and economy demand that every effort should be made to bring this about.

Section 12 makes it an offence for any person to sell or offer for sale milk from any cow which to his knowledge has given tuberculous milk, or is suffering from tuberculosis of the udder, or from acute inflammation of the udder, or is emaciated from tuberculosis; and section 13 provides for the taking of samples of milk at any time before delivery for examination. All sanitary authorities as well as medical officers of health are given these powers, and in the event of the needful staffs being provided to allow of their proper enforcement they will prove to be most valuable.

Under section 14, the Local Government Board may require the council of any county or any sanitary authority to appoint veterinary inspectors, and to employ bacteriologists.

Section 15 enables the Local Government Board to make Orders for the purpose of carrying into effect the Act, and the matters with which the Orders may deal embrace practically all that can be desired. It is one thing to frame Orders, however, and quite another thing to ensure that they will be enforced. For many years, under the Dairies, Cowsheds and Milkshops Order, regulations have been in force throughout the country, but in most districts they have been pigeon-holed. Now and again, but only now and again, one comes across instances in which they have been enforced up to a point, but hardly ever adequately, mild though their requirements are. How then can we hope that future regulations, which must be far more precise and stringent, will be more seriously regarded by the same bodies who have disregarded less stringent regulations in the past?

Section 19 provides for the establishment of milk depots in towns with a population of fifty thousand and upwards. The establishment of milk depots is a poor, although in some cases it may be a wise, expedient. Such measures, however, must not be allowed to weaken in any way our efforts, educational and otherwise, to secure in the first place a clean and pure milk supply, and secondly, to bring home to the public the value of

milk as a food, and the need of safeguarding it from domestic contamination. We must not be satisfied with makeshift expedients, and in so far as they are adopted their limit of value must be recognised.

By section 20, the last I specially refer to, county councils are empowered to hold public local inquiries when complaint is made to them by one of the following, to the effect that district councils have failed to fulfil their duties under the Act:—

> (*a*) By any four inhabitant householders of the county district; (*b*) By the parish council or parish meeting of any parish within the district; (*c*) By the sanitary authority of a district within which milk is supplied from any dairy in the county district; (*d*) by the medical officer of health of the county; and if the ground of complaint is substantiated the county council may take over the duties under the Act of the defaulting authority.

One's experience of the total disregard of similar powers by householders and parish councils in relation to neglect of sanitary duties by rural district councils, conferred by the Local Government Act, 1894, does not encourage much hope that either will avail themselves of these additional privileges; but as regards the other possible complainants, namely, county medical officers of health and sanitary authorities into whose districts milk from the county district is sent, the position may be more hopeful as to their taking advantage of the section, and, in that event, the steps which would necessarily follow would have a most wholesome direct and indirect effect.

Now with regard to the Tuberculosis Order of the Board of Agriculture and Fisheries. Without going into detail, it may be said that the Order gives certain far-reaching powers to local authorities under the Diseases of Animals Acts. It provides for the compulsory notification of udder disease, and what appears to be tuberculosis with emaciation in bovine animals, by persons having such animals in their possession or under their charge, and by veterinary surgeons in their private or public capacity. The Order also provides for the inspection of such animals by veterinary surgeons appointed by the authority, and lays down how the animals and the milk which they supply may be dealt with. The authority may also order the slaughter of the animals, paying compensation to the owner on a scale which is governed by circumstances. The expense thus incurred is chargeable to the rates of the area under the Act; but during the first five years one-half the sum will be repaid to the authority by the Treasury. It is important to notice that beyond authorising the enforcement of cleansing and disinfection of "that part of the shed or other erection in which the animal has recently been placed or kept," the Order gives no

power to the authority either to note or to deal with the general sanitation of the premises.

This being the case, and as compensation seems to follow as a natural consequence of a slaughtering order irrespective of other considerations, it may very well happen that in districts where the Milk and Dairies Act is inadequately enforced, conditions will continue to exist which tend to encourage the growth and extension of the disease which the scheme of compensation is intended to extinguish. In such an event, except in the case of county boroughs and of municipal boroughs of over ten thousand inhabitants, sanitary authorities who conscientiously enforce the provisions of the Act, thereby, we may infer, rendering the slaughtering of animals less and less necessary as time goes on, will equally with less worthy authorities be called upon to contribute towards an expenditure which, through the inactivity of the latter, is greater than it need be. Surely this in itself is sufficient to justify less decentralisation than the Bill provides for, and consequently greater uniformity of administration, not to mention resulting facility as regards Government-control.

To sum up the position, it will be gathered from what I have said regarding the Bill that what fault I have to find relates chiefly to the machinery of administration. There are other minor matters which might have been commented upon had I been on the look out for defects, but I thought it best to keep to broad principles; and, looked at from that point of view, if asked to express in a few words my opinion of the Bill, I should be inclined to say that, except in so far as it applies to county boroughs, it is a jumble of divided responsibility, and if all the authorities on whom it confers powers determine to exercise them, a dairy-farmer's life in future will not be a particularly happy one.

MR. J. Q. LAMB, speaking as a dairy farmer, said that things were not nearly as bad as Dr. Reid would make them believe they were. There was a certain proportion of milk not produced under ideal conditions, but when they considered the quantity of milk produced and consumed each year, the amount not produced under ideal conditions was a small proportion only. Farmers were not responsible for the whole of the conditions of the milk as it reached consumers. There was the condition and method of railway traffic, and milk was also contaminated after it had left the hands of the distributor. Milk was not wilfully contaminated by farmers, who desired to produce a pure, cheap, and wholesome article. He believed a very small proportion of the tuberculosis in the country was caused through milk. The great evil was insanitary conditions of the buildings and houses in the large towns. If they

expended their energies on the better housing of the public they would do more towards the eradication of tuberculosis than by condemning what was a good and wholesome food.

Dr. Robinson (Leicestershire County Council) said it was not the good dairyman who had anything to fear from the Bill, but it was the class of dairyman whose conditions of producing milk were too filthy to mention. He agreed with Dr. Reid that the Bill was a jumble of divided responsibility. He had come to the conclusion that the Bill was unsatisfactory in that respect, and did not strike at the root of the evil, the remedying of the administrative defects. He suggested either the whole of the work should be carried out by the district councils, and that the district councils be required to send detailed reports of such work to the county council, which latter authority should be constituted the supervising authority; or the whole of the work should be carried out by the county council. He had come to the conclusion that the county council was the proper authority to deal with the question, though he would rather the work should be done by the rural district council if a proper way could be found of compelling them to do their duties properly and faithfully. He objected to the principle of the court of summary jurisdiction being called in to settle disputes of a technical character, and to vary orders and decisions founded on expert advice. It was unfair to dairymen to drag them before this court on many of the questions in the Bill, and it was just as equally unfair to allow landed proprietors to adjudicate on what were reasonable alterations or improvements as to allow brewers to adjudicate on licensing questions. Some higher sanitary authority or some specially appointed arbitrator should carry out this work. Unless the Local Government Board prescribed fixed minimum standards the main objects of the Bill would be defeated. He suggested that annual registration should be required, which would overcome many difficulties and be a greater incentive to provide and maintain proper standards of sufficiency. The dairyman, when registering, should be required to give the name and address of the landlord or his agent, and also to state if any conviction or order had been made against the applicant. The inspecting officer should have power of entry during milking hours. In his opinion the Tuberculosis Order would be rendered very much less effective unless the Local Government Board compelled the appointment of veterinary inspectors and the necessary inspections under section 14 of the Bill.

Sir R. P. Cooper (Staffordshire County Council) said there would be a good deal of difference of opinion with regard to the Bill, and also with regard to the Tuberculosis Order. They should not look at these two measures only from their own point of view; it was for the good of all concerned that the four Acts or Orders (1. Dairies, Cowsheds, and Milkshops Order; 2. Milk and Dairies Bill; 3. Tuberculosis Order; 4. Diseases of Animals Act,

1894) should be rolled up into one or two, and after the order had been working some time they might look forward to having it amended, simplified, and made more acceptable to all classes. He deplored the talk about filthy conditions. Possibly there had been exaggeration, but there were some grounds for all the statements that had been made. The condition of things could not be allowed to continue, and the sooner dairymen recognised that fact the better it would be for them. Cows giving tuberculous milk were a menace to public health and to the well-being of other animals in the herd, and the sooner they were slaughtered the better.

The Act must be administered with patience, common sense, discretion, and then with firmness. It would take some time to get the machinery into order, and with regard to the Tuberculosis Order there was only a skeleton of a machine. The Staffordshire County Council was now taking the matter into consideration As long as the control was left to the rural district councils the work would never be well done; the matter must come under the county council.

Animals giving tuberculous milk should be slaughtered, but it was only right that the dairyman should receive fair compensation for animals so disposed of. His experience went back to the time when pleuro-pneumonia existed in this country, and he knew that when slaughter was resorted to reasonable compensation was given; and no case of complaint that this was not so came before him, though he had something to do with the administration of the order, and dealt with a good many cases. It must be remembered that an animal in the advanced stage of tuberculosis was worth very little to the owner, as the carcase could not be disposed of for human food without the risk of prosecution following.

Sir Richard then gave particulars of the experiment carried on by the Royal Agricultural Society of England in Bedfordshire, stating that a farm had been secured with the homestead in such a position that it was possible to prevent the introduction of any tuberculous animals on to the premises. Cows in an advanced state of tuberculosis and in-calf had been purchased through the generosity of Lord Rothschild. These cows calved in premises some little distance away, and the calves were at once removed to the homestead and fed on sterilized milk. The calves were under the supervision of Sir John McFadyean, Principal of the Royal Veterinary College, who reported monthly to the Council of the R.A.S.E. The experiment had been going on for two years, and up to now all the calves were absolutely free from tuberculosis. This shewed that the disease was not hereditary, but infectious, and should act as an inducement to all persons having tuberculous animals to clear them out as soon as possible. The experiment could not fail to be of interest to everyone identified with the dairy industry.

PROFESSOR WILSON (Harper-Adams College) said there was a desire on the part of dairy farmers to shift the responsibility to someone else. The valuable experiments mentioned by Sir Richard Cooper, upon calves born of tuberculous

cows, being carried out by the Royal Agricultural Society at Woburn, would serve as a unique object-lesson to dairy farmers all over the country, if they would only profit by it, as it was by that sort of work that farmers were able to learn much. Commenting on a paragraph in Dr. Reid's address that the inspection of dairies by the medical officer of health was hindered in that he could not examine cows unless he was accompanied by a veterinary surgeon, he was certain that the opportunities a veterinary surgeon would have as a whole-time officer would meet the requirements of the farmer as well as the medical officer of health. The present-day training of a veterinary surgeon was such that every facility was given for efficiency in the necessary technique for bacteriological work, which was now more necessary under the clauses of this Bill than hitherto, so that it naturally behoved the profession to show their fitness for the work shortly to be put upon them. If the county council wished to carry out adequately the provisions of the Tuberculosis Order and the Milk and Dairies Bill, they should have a whole-time officer who should be responsible to the medical officer of health, and would work in conjunction with him.

Dr. Barwise (Derbyshire) said that large dairymen had no idea of the filthy conditions under which milk was produced in some small farms. He believed that those agriculturists who had come into actual contact with medical officers over troubles they had had, recognised that they were only trying to do their duty. They had to create a little public opinion to make up something for the lost time of the ten years when it was regarded as doubtful if bovine tuberculosis was communicable to man.

Dr. A. B. McMaster (Crewe) said public health administrators in this country had been looking for the time when legislation, such as that foreshadowed in the Milk and Dairies Bill, would be forthcoming to extend the powers possessed over the milk supply, and to further their efforts to raise the standard of its purity.

The public were largely to blame for the present unsatisfactory state of affairs, and that if they demanded a clean milk supply it would be provided.

What encouragement was it to any milkman to endeavour to supply pure milk if he was met at the various houses on his round with the dirtiest of jugs, bowls or other receptacles. Many a milkman has said that no wonder need be expressed as to the cause of sickness in some houses, if the dirty milk-vessels used to receive the day's supply were taken into account.

The persistent carelessness indulged in by the farmer in leaving the daily cleansing of the place, the removal of manure, etc., till a late hour in the forenoon was one of the causes of the dirty condition in which cows were frequently found. The amount of daily grooming required would be very much reduced if the daily cleansing of the premises was carried out at an early hour.

There was additional pollution in the milkshops in towns, where mixed businesses were conducted, and more extended powers to deal with such premises

in a reasonable, fair and equitable manner to both the milk-dealer and the public who consumed the milk, would be welcomed.

To secure these and many other necessary improvements, the regulations made under the Act would be of great importance. The hands of the local administrator, especially in small districts, would be strengthened in the carrying out of the reforms if ample details were given in the official orders and regulations.

DR. G. PETGRAVE JOHNSON (Stoke-on-Trent) expressed the opinion that the Bill would as a whole prove to be a good one if passed into law, and would tend to stir into activity the farmers, public authorities, and officials, and also those who were responsible for the carrying of milk: railway companies, etc.

He regretted that while section 4 of the Infectious Diseases Prevention Act, 1890, would be repealed by the Bill, there was no provision in the Bill itself whereby a medical officer of health could obtain power to visit a farm outside his own area. Under certain circumstances this might be desirable.

He observed that in the Memorandum to the Bill it was stated that, as to inspection of dairies, etc., the Bill was based on the provisions of the Public Health (Scotland) Act, 1897. Under that Act it was provided that a list of customers of a dairyman could be demanded by any authority; this was a very useful clause, but he was not able to discover any similar provision in the present Bill. Sources of supply could only be obtained, but not lists of customers.

For the first time, medical officers of health would have full power to inspect the persons employed in any dairy.

Under section 4, sub-section 2, if an order was made prohibiting the sale of milk from a dairy, the responsible authority had to inform the notifying authority, if there be one, of the case. It would, he thought, be better if it were compulsory to give information to all authorities where the milk was supplied.

On the Bill as a whole he had formed the opinion that it would have been wise if clauses framed to deal with prevention of tuberculous disease had been separated from those framed to deal with the more acute infectious diseases, and thought that in dealing with the latter it would be better to proceed through the district and borough councils with a proviso that the county councils be kept fully informed; while, in dealing with tuberculosis, the county councils and the county borough councils should act with the aid of the Tuberculosis Orders of the Board of Agriculture, 1913. This should be comparatively easy.

He hoped that rules and regulations made under the Act would be as definite as possible in their requirements, though no matter what the provisions of the Bill were and what regulations were made, the results depended upon the authorities and their officials, backed by public opinion.

MR. G. A. PATTERSON (Staffordshire County Council) stated that he had no sympathy with those producers of milk who through their own neglect placed

upon the market milk which was not pure, but he had sympathy with those farmers who had to produce an article, and who alone knew the difficulties they had to contend with. He had not met a farmer who desired to do other than produce the best and purest milk. He thought the general body of dairy farmers had accepted the Bill in principle, but what they feared was that the administration of it might be more drastic than discreet. He rather feared the Bill might make it difficult for farmers to produce milk, and that would be to the disadvantage of the public in that there would be a diminution in the production of milk. There was one method which he hoped to see introduced into this country, and which would do more than anything else to produce clean milk, and that was the introduction of a satisfactory milking machine.

MR. J. MALCOLM (Birmingham) said with respect to clause 1, which provided for the registration of dairies as well as dairymen, that this was a necessary step. It would, in effect, legalise the practice now customary in many districts. A defect of the clause was that after a dairy was once registered it might continue on the register after it had become unfit through time or other cause. After registration, subsequent inspection of premises was purely optional. Periodic inspection ought to be obligatory. In the Scottish Milk Bill, 1913, clause 4 provided that "it shall be the duty of the medical officer of health or officer appointed from time to time, and once at least in every year, to inspect every dairy in the district, and to report to the local authority whether such dairy was in conformity with the Act and the by-laws made in the terms thereof." A similar provision should be in this Bill.

Another defect was the court of appeal provided. Any appeal was to a court of summary jurisdiction. Now, such a court frequently consisted of landlords and farmers: the classes upon whom the cost of structural alterations fell, and such a court was liable to be unconsciously biassed. In the Scottish Bill the appeal was to the sheriff. In the English Bill any appeal ought to be to an equally independent unbiassed court.

It should be remembered that this Bill, if passed as drafted, would limit the existing powers of many medical officers. Under existing local Acts it was usual for the medical officers of health, of the districts they referred to, to have power to at once suspend from distribution any milk supply that was causing infection among the inhabitants. Such powers were, of course, subject to the payment of adequate compensation by the local authority to the dairyman if a mistake was made. The Bill did away with such summary power so far, at least, as any milk supply coming from an outside district was concerned. The removal of this power was a retrograde step.

The substitute provided was not sufficient, as the loss of time in applying it might be serious. The provision to quadruple inspectors in such a case was absurd, must add greatly to the expense, and increase delay. The absence of any provision for the systematic inspection of the cows was another defect. The

Scottish Bill provided that "it shall be the duty of the veterinary inspector from time to time, and once at least in every year, to inspect the cattle in every dairy in the district, and to report" the result of such inspection. A similar provision should be in the English Bill.

DR. REID, in reply, said, it was the rule, not the exception, for the milk supply of the country to be produced under unwholesome conditions; from a long and extensive experience, he unhesitatingly asserted that he had not overstated his case. He admitted that the milk during distribution and storage in houses was exposed to further contamination, but the real damage was done in the first instance.

As regarded Professor Wilson's remarks, he was glad that one holding the position he did agreed with him as to the present unwholesome methods of milk production; and as regards the only adverse comment Professor Wilson had made, it arose from a misconception of what was stated in the paper regarding the hindrance to the medical officer of health by the insistance that he may only examine the cows if accompanied by a veterinary inspector: the "hindrance" referred to was that, if carried to its legitimate conclusion, this requirement would mean that the medical officer of health could not even look at a cow from the point of view of its external cleanliness; he certainly did not wish to imply that the medical officer of health should assume in any way the duties of a veterinary inspector regarding the strictly clinical work.

As regards Mr. Patterson's comments, he agreed that the dairy farmer had no special desire to produce unclean milk, but what he said and what he maintained was, that the mass of milk producers paid quite inadequate regard to the conditions under which alone pure and wholesome milk could be produced; and, moreover, that when improved methods were suggested, they scoffed at the notion of their adoption. As regarded the landlord's responsibility, no doubt there was something to be said; but no matter what provision was made in the way of wholesome cowsheds, unless the farmer realised the importance of clean surroundings and clean air, and got rid of the idea that profitable milk production was only possible if the cows were kept in stuffy unventilated sheds, no improvement could be effected.

Had district councils done their duty in the past there would have been no need for new legislation.

Our Milk Supply, by W. J. ADDISCOTT, Chief Sanitary Inspector, County Borough of Plymouth (ASSOCIATE).

Read at Sessional Meeting, Plymouth, March 14th, 1913.

I CONTENT myself by treating the question as a layman from the following points:—Why is there so much filth in the milk? Can this contamination be prevented? Is the present state of the law sufficient to deal with the evil? and if not, how far can the law be strengthened to improve the present state of affairs?

Firstly: Why is there so much filth in the milk? Carelessness and ignorance on the part of the persons in charge are primary causes, to which may be added, in many cases, a desire for extra profits, and appropriating for other purposes the money which should be spent in improving the general conditions under which milk may be produced.

Under the head of ignorance comes the case of the person who has not been sufficiently trained for the work, does not think that strict cleanliness is of sufficient importance, and regards the regulations under the Dairies, Cowsheds, and Milkshops Order of the Local Government Board as so much nonsense. We have the authority of Dr. Addison, who stated in the House of Commons in June last that "Much of the milk sent into our towns was so dirty and filthy as to be unfit for human food."

The first filth is received in the milking shed, cowhouse or shippon which according to regulations should be cleansed and limewashed at least once in six months. Judging by the state of some of these places one would imagine the regulation to be "not oftener" than six months, and not then unless attention is called to the insanitary condition by the officers of the local authority. These buildings are generally divided by a loose-fitting floor into two parts, the upper part being used as a hay loft or store for agricultural implements; the roofs are seldom wind or watertight, with rough surfaced walls, and the whole decorated with festoons of cobwebs, filth and sacking in various stages of decomposition; when added to this is the defective paving and drainage of the floor surface, it is not surprising that with every gust of wind or current of air, dust and dirt of a harmful nature finds its way into the milk as it stands awaiting removal in the pails at the close of the milking operations.

With regard to the milkers, carelessness contributes to contamination. How many milkers are there in the average farm who habitually wash their hands prior to milking, although coming direct from handling manure or soil? who will moisten their hands with the first drawings

from the cow, and content themselves with no further cleansing? The particles of dung found in samples of milk are sufficient evidence of the unwashed udder. No one but the most inexperienced could fail to be alive to the fact, that while there are some model institutions and farms in which everything is as perfect as possible, yet in spite of the great improvements in these places in late years, the ordinary surroundings of the dairy farm in a typical rural district leave much to be desired.

From the cow-house we pass to the dairy, a usually cool and well ventilated apartment, and provided it is not used for storing potatoes, turnips, and other vegetables well coated with soil, little fault is to be found with it. The ventilators are, however, often unprotected, and no provision, by way of a mat or scraper, is made to prevent dirt being carried into the dairy by the boots.

The distribution of the milk is an important factor to which attention must be paid. Some years since it was no uncommon sight to see milk carts and waggons returning from the towns laden with stable manure, pigs' wash, and other objectionable material, the milk cans being packed in or thrown on the top regardless of the contamination thus incurred. This practice has been prohibited in Plymouth, and is now a thing of the past, but the condition of many of the carts bringing milk into the towns from the outlying districts leaves much to be desired. The churns by which milk is conveyed by train could with advantage be altered. I recently observed at a railway station a churn of milk standing on the platform in a heavy downpour of rain, awaiting removal. The ventilating hole in the centre of the cover was below the level of the outer ridge, after a short time the water rose to the level of the vent hole which served as an overflow through which the water poured, carrying with it impurities washed down from the atmosphere, thus pollution and dilution was accomplished.

My final point under this head deals with the milkshop, or to be more correct, the small general shop from which milk is vended.

In the districts where shops of this kind abound, the people are practically dependent on them for their food supply. Replying to a question in the House last June, Mr. John Burns stated that no fewer than 1,144 of such class of milkshops had been struck off the register in London during 1911 as being unsuitable for the sale of milk.

Secondly: How can contamination be prevented? To bring about a better and more healthy state of affairs than at present prevails, and which I have briefly described, cordial co-operation must prevail between the dealer, of whatever grade, and the officers of the local authority.

The cowsheds should be rearranged where possible, so that the cows may not be tied with head close to the wall, breathing over and over again the same air; or by having them tied face to face so close that one row is breathing the exhalations of those opposite. The absorbent insanitary wood partitions may be replaced by galvanised iron bars or slate, the lower edge raised about a foot from the ground, which would not allow of any corners in which filth may lodge; the roofs should be made wind and watertight; the walls rendered with a smooth impervious material capable of being hosed down; and windows so arranged that the maximum amount of sunlight, the great destroyer of disease organisms, may be admitted. Efficient ventilation, which ensures a constant supply of pure air for the shippon, will do much to prevent dirt getting into the milk. The floors should be properly paved with an impervious material, with watertight joints, drained and channelled, capable of being hosed down prior to each milking, thus laying any dust that may otherwise be disturbed by the entry of the cattle. The milkers should wear white overalls kept specially for the purpose; each cow to be milked into a separate pail, smaller than the one now in use, and fitted with a cover which is to be placed on immediately the cow is milked. The water used in connection with these places must be above suspicion for obvious reasons.

Farmers are further warned against using wooden pails, as they are likely to retain organisms. With reference to the churns used for the transmission of milk, means to prevent pollution such as indicated may be taken by raising the vents of those churns to a height above the level of the outer edge.

In a retail shop, as well as in those used for the sale of dairy produce exclusively, the pans should be covered by means of muslin stretched over a cane ring fitting over the top of the pan; this will not get blown off, as it would if loose. Where this plan has been adopted it is surprising, during the prevalence of high winds, how much extraneous matter has been collected on the muslin, which otherwise would have found an abiding place in the milk. In the warmer weather it prevents flies gaining access to the contents of the pan. No milk should be sold from the same part of an establishment as that from which other commodities are sold or stored.

My last two points, viz., Is the present state of the law sufficiently strong or should it be strengthened, I deal with jointly, as the defects in the present state of the law are so closely allied to the improvements we so much desire. That the present state of the law for remedying the evils arising from dirt in the milk is not sufficiently strong is shown by the

demands constantly expressed in journals by members of the medical profession and others who have this subject at heart. Under the existing Cowsheds, Dairies, and Milkshops Order, much good has been done by local authorities who have adopted the regulations; but in a recent report of the Local Government Board we are informed that 75 urban and 69 rural authorities have not yet availed themselves of these recommendations. In many places where they have been adopted, owing to lack of appreciation on the part of the public representatives, they are held in abeyance. Specially is this so in the rural districts which are governed by the class who have vested interests at stake. One measure which would do much to bring about an improvement is to have all officers charged with carrying out the provisions of any Act which may come into force, under the direct protection of the Local Government Board or other Government Department, so that their duties may be carried out without the fear of evil consequences falling upon them as a reward for doing their duty towards the general public.

To assist the officers of the smaller districts, power should be given to the larger authorities of over 50,000 population to inspect any place from which milk was supplied to their district, and just as the dairyman can be prohibited from supplying milk to which the spread of infectious disease is attributed, so the same embargo should be placed until such time as the cowhouse, etc., had been made fit to the satisfaction of the authority complaining, and in accordance with the regulations set out.

OBITUARY.

Surgeon-General John S. Billings (hon. fellow).

It is with deep regret that we have to announce the death of Surgeon-General John S. Billings, which took place at his residence in New York, on March 11th. His death has removed from the list of Honorary Fellows of The Royal Sanitary Institute one who was intimately associated with all that appertained to public health work and preventive medicine. Born in 1839, he was educated at the Medical College at Ohio, and is chiefly remembered in this country by his great work on the *Index-Catalogue* of the library connected with the Surgeon-General's office at Washington. Surgeon-General Billings served throughout the Civil War in the Northern Army of the United States, and at its close was appointed Medical Inspector of the Army of the Potomac; subsequently he became attached to the Surgeon-General's office in Washington. In 1891 he was elected Professor of Hygiene at the University of Pennsylvania, and Director of the Hygiene Laboratory. In 1896 he was appointed Director of the New York Public Library, which office he held to the close of his life.

Surgeon-General Billings's work was recognised in this country by almost every educational authority. Honorary degrees were conferred on him by Oxford, Dublin, Edinburgh, and, in his own country, by Harvard and Yale. He was the author of many papers on vital statistics and hygiene. He was a great organiser and administrator, and his capacity for work was unequalled.

In private life Surgeon-General Billings was a most delightful companion, and the best and kindest of friends. Sincere, sympathetic, and most unselfish, he was ever ready to assist by kindly counsel and advice. It was the privilege of the writer to be associated with him in some of his investigations on the Continent, and one can only repeat that he had the loftiest ideals in life, and truly it may be said he lived up to them. He was elected an Honorary Fellow of The Royal Sanitary Institute in 1890, and always interested himself in its work.

J. L. N.

Volume XXXIV. No. 6. Issued July, 1913.

JOURNAL

OF

THE ROYAL SANITARY INSTITUTE

Environment in relation to Disease, by E. H. T. NASH, D.P.H., Medical Officer of Health, Wimbledon (MEMBER).

Read at Sessional Meeting, Wimbledon, April 12th, 1913.

IN discussing the relationship of environment to disease, I do not enter into the familiar facts, such as the mortality from phthisis in Sheffield grinders and Cornish tin miners or lead poisoning in pottery works, but confine my attention more to the question of houses and the individuals that live in them.

Of recent years housing has been in the forefront of the public health movement, culminating in the Housing and Town Planning Act, and everybody seems to be struggling to find the design for the ideal workman's cottage; again and again figures have been put forward to show the grievous mortality occasioned by housing conditions, particularly in some districts with back-to-back houses; but whilst all these figures are being accumulated to show the grievous conditions resulting from improper housing, one of the most important factors of the whole lot is being lost sight of, the individuality of the persons inhabiting these houses. We have been relying too much on statistics in bricks, mortar, and air space without considering the human element, which is the point I wish to lay special stress on. In all the figures that I have seen with regard to these mortalities in poor districts, there have been no contrasts to show the lessened mortalities which have arisen through the transference of a certain population to some other district, and I doubt if these figures can be obtained except from some special housing scheme where the population has had to move *en bloc*. Experience has shown that wherever a housing scheme has been enforced, and insanitary property demolished, a large

proportion of the people evicted do not enter the better-class houses provided, as would be expected, but distribute themselves largely amongst streets in which their own type of individual exists. There was no more important piece of advice given by the chief medical officer of the Local Government Board to medical officers of health than to concentrate investigations into small areas.

An excellent opportunity of examining into the causes of increased mortality rates occurs in two districts in my neighbourhood. In the first instance there are four roads, three of which run parallel, and the fourth crosses the end at right angles. The three parallel roads run due east and west. The width of road is 40 feet, and with the exception of five houses the distance between the houses is over 55 feet. The greater part of the road running across the three is fronted by a large open space, the nearest house being over half a mile away. The figures which I am using are of course small, and therefore the probable error must be somewhat large, but I am dealing with a population in this instance of roughly 1,600 people, and have taken the figures for the past three years. For the convenience of illustration we will call the three parallel roads A, B, and C, and the cross road, D. Taking the figures of the general mortality rate for the last three years, they are:—In A, 27·6; in B, 5; in C, 14·3; and in D, 4 per 1,000.

In examining the deaths of the children under five in the same area we find that in A, the mortality is 21·1; in B, 2·5; in C, 9·1; and in D, 2 per 1,000.

From which it will be seen that the heaviest mortality is amongst the children. Further, in examining the infantile mortality, that is the ratio of deaths in children under one year of age in comparison to 1,000 births, we find that in A, it is 333; in B, 22; in C, 127; and in D, 80 per 1,000.

During the three years under discussion the mortality was:

	General Mortality.	Infantile Mortality.
1910	7·9 per 1,000.	74 per 1,000.
1911	8·9 „	110 „
1912	7·6 „	67 „

The question may be raised as whether these figures may not be the result of overcrowding, but the average number of persons per house in the respective roads are: in road A, 4 adults and 4·5 children; in B, 3·4 and 3; in C, 3·6 and 4·4; and in D, 3 and 2·9.

The houses in these streets are of comparatively modern construction, with proper sanitary conveniences, and owing to the constant house-to-house inspection, kept in a comparatively decent condition. In the three

parallel roads the houses and flats are of much about the same type, with good through ventilation, and apart from the comparatively small increased proportion of persons in each tenement, one is brought face to face with the question, what produces such strikingly discrepant results in mortality rates in these houses, whose conditions as regards air space and light are all good of their kind? One is face to face with the fact that there is something not concerned with bricks and mortar, drains, or air space which must produce this constant difference; and one is brought to the conclusion that these mortalities are not the result of environment so much as the result of conditions attaching to the individuals themselves.

Again, to take another district in which the same conditions as regards housing exist, with the exception that the ground is slightly lower, and the water level nearer the surface. In this case we are dealing with a population of, roughly, 1,500 people in three parallel roads which run north and south. For the purpose of comparison, these roads may be called X, Y, and Z. In road X the general mortality rate is 20·9; in Y, 12·2; and in Z, 4·2 per 1,000.

If we examine the mortality of children under five, we find that the mortality in X is 15·1; in Y, 8·5; and in Z, 2·5 per 1,000.

With regard to the infantile mortality, the figures are: in X 277; in Y, 206; and in Z, 60 per 1,000.

Here again we see that this is not a question of environment so much as of the individual, and this human element, unfortunately, has been too much disregarded, and I am convinced that if the class of individual inhabiting these houses were transferred to better-class property, they would reproduce to a large extent the same diseases with the same toll of deaths. The question is: What are the conditions which are responsible for this mortality, which is largely confined to children under five years of age?

We may divide the people in these districts into two classes, (i) the unfortunately poor, and (ii) the careless poor; and further figures are wanting which can only be obtained by minute observation over prolonged periods to show which class of individual is responsible for these mortalities. In class (i) I put the decent, honest poor who through loss of work or sickness have come down and are struggling on, in many cases, against fearful odds to keep out of the clutches of the Poor Law. I have come into contact with a considerable number of their budgets, and can only be amazed at the way in which they keep things going. There must be something radically wrong with our system of public assistance which allows parents to half starve their children for prolonged

periods, and to undermine their health to such an extent as to make them an easy prey for various illnesses. I appreciate the difficulty in having some deterrent against continual cadging by the work-shy, but meantime we are face to face with the fact that the parents' and the children's constitutions are being grievously undermined. In addition to these there are the respectable families whose income is so small that both parents have to go to work, and even then the joint wages fall below the point necessary for proper subsistence.

The second class may be divided into two sub-classes, the first consisting of those whose carelessness is due to ignorance and want of a better example in early days, and the second of the callous, mostly from personal character, and in many instances alcoholism. In both of these the income is such that the children are nearly always in a sub-normal state of health. They are often grievously neglected owing to the parents being out at work all day, and to the youngsters having to a certain extent to fend for themselves. The debilitated condition of this class renders them an easy prey to disease, and their dirty habits are undoubtedly a contributory cause in some cases.

Having designated some of the factors which go to make up this toll of death, the question arises, what is the remedy? Much of it is a social problem which a public health department cannot touch, and is intimately bound up with the question of wages.

On the other hand there is the character of the individuals, particularly of those we class as ignorant. A great deal can be done in the way of educating a section of these people in the ways of looking after themselves and their children, particularly their infants, and helping to build the characters of the individuals. Much of this can be done by tactful, sympathetic health visitors, going amongst the people as their friends. At the same time there is a large opening in this character building, to which I attach much importance, for trained voluntary workers who would act under the public health department through its health visitors. Our greatest hope is in character building, and as one who has had a great deal to do with the Salvation Army, I have been immensely struck by houses which have been entirely altered by the reclamation of a parent. There is a large scope for women who want an outlet for their philanthropic energies to carry out this work, each being given only a few houses on which to concentrate their attention. Indiscriminate charity, particularly as practised through the churches, is one of the greatest hindrances to raising a certain section of the people.

There is much to be done in many districts in the matter of housing,

but at the same time it must be realised that it is little use going round preaching the doctrine of open windows, when the people of whom we are speaking have insufficient means for anything but the most meagre fire; none too much clothing; and none too much food. In order to avail oneself of the benefits of fresh air, particularly in the winter, the individual must be well fed and sufficiently clothed, and it is impossible to expect these people, amongst whom this heavy mortality exists, to keep their windows open when often their only bed covering is a single blanket which has got to do duty for as many as three or four individuals, and it is not to be surprised at that one finds the windows in many of these houses hermetically sealed, and the fire-places stopped up. The time has come when we can do something towards the diminution of these appalling death-rates by introducing into our work amongst the dry materialism of bricks and mortar a little more of the elevating influence of human sympathy.

Aids and Hindrances to the present-day effort to diminish Tuberculosis, by J. H. Garrett, M.D., D.P.H., Barrister-at-Law, Medical Officer of Health, Cheltenham (member); and J. Middleton Martin, B.A., M.D., D.P.H., County Medical Officer of Health, Gloucestershire (member).

Read at Sessional Meeting, Cheltenham, May 16th, 1913.

By J. H. Garrett, M.D., D.P.H.

THE subject is a vital one, which requires discussion perhaps more imperatively than any other connected with preventive medicine.

At the present moment a national effort, assisted by a generous expenditure of national and local money, is being made to diminish tuberculosis, which is one of the most important and one of the most fatal diseases affecting the inhabitants of this country. In order that this effort may not be in vain, and may not result in waste both of money and labour, it is essential that the conditions attending the development and course of the disease, and the available ways and means of dealing with it, be clearly understood. It is by no means necessary that this information be confined to the members of the medical profession, though there is a scientific side to it which is not capable of being comprehended by the average layman without such study as he is unlikely to be able to give to it, and which must consequently be accepted and credited with patience. The subject is causing a strain of intellect for its unravelling. Some of the best intellect available is engaged, but limited human intellect all the same, which is trying to stretch itself to understand what is not yet sufficiently obvious to be taken into comprehension. Yet we may be sure the knowledge we want is coming, and will be at our service some day. And what should be our attitude towards these students and experimenters if not one of uncritical sympathy and assistance, if it be in us to render any sort of assistance in the inquiry?

Nevertheless, because truth is essential to all real success, it is necessary to remember at the present time that whilst there are certain propositions connected with the causation and development of tuberculosis which are everywhere accepted, there are others which are but in the region of conflicting theory; and although there are advocates of this and that method of treatment, many of them enthusiasts, it is becoming more and more evident that there is no known cure for the disease, and there is grave reason to doubt whether the vaunted modes of treatment by residence in sanatoria, by tuberculin injections, or by any other method

have in any considerable degree the value that has been claimed for them. Scientific statisticians of the greatest eminence tell us that the statistics issued from the already long-established institutions for the treatment of tuberculosis are fallacious, and that the claims of the dispensaries will not bear investigation, whilst the effort to square all the contradictions of the scientific experimenters has led to the invention of very complicated hypotheses, which do not strongly appeal to an ordinary mind as likely to be a reliable representation of the processes that are at work within the body. In fact the effort, laudable as it is in its desire, is in front of knowledge, and in so far must be doomed to wasteful failure when considered as immediately applicable for the prevention and cure of consumption.

If there have been persons who have cried out "Give us the money and we will prevent and cure the disease," they were mistaken in their powers, or not over conscientious, because they knew no method by which it could be done. And yet it may turn out that the expenditure, though seemingly wasteful at the moment, was required to cause that closer study of the disease in all its bearings which is now likely to come to pass: the recognition of our ignorance is a step towards the requisite knowledge.

The people who say "You must keep pegging away," after all, may have their reason, as well as those who say "Rather than do the wrong thing let us do nothing; let us be certain of our ground before we move." Doing nothing leads to nothing. The work and worry, criticism and thought connected with the spending of money and time in trying to cure this fell disease by feeble methods must result in the acquisition of stronger weapons. We live in an expectant era, in which the mind ceases to be moved to wonderment by reason of frequent marvels. The discovery of some specific cure or protection against the causing germ of this disease, is not beyond the realm of legitimate hope. Are there not certain half-analogous instances in which the feat has been performed?

Pending that, let us consider whether we have any present knowledge capable of being applied to materially diminish tuberculosis. There is the birth-right of tissue immunity, or lack of immunity, and the resulting safety from the disease or proneness to it. Speaking of tuberculosis, I heard someone say at a meeting, not long since, that we had got rid of "the bugbear of heredity"; I suppose the wish was father to the thought, and some of the professional preventers of tuberculosis would, no doubt, like to erase the indelible mark of its progenitors, by which every animal, and every vegetable too, for that matter, is for ever branded. As a general statement, it is true to say that the neurotic stock breeds true, and so does the tuberculous. Or, perhaps, it is better

to say that the more or the less anti-tuberculous stock breeds true. The natural immunity to the disease germ is strong or weak. The tissues are of the quality of the strain. Do we not breed a strain of hens to lay most eggs? And do we not avoid the strain of potatoes that are most prone to rot? In dealing with bovine tuberculosis the whole effort to prevent the disease turns upon eradicating the affected strain by outbreeding it. Our veterinary surgeons are not seriously trying to abolish tuberculous cattle by other means than slaughter, and by breeding restricted to non-tuberculous strains.

Professor Metchnikoff, and other persons, suggest that an immunity can be obtained by the individual during his own life, as distinct from his ancestral immunity, by a process latterly spoken of as vaccination, and straightway the longing mind seizes the suggestion, and declares with ecstacy "We have got rid of the bugbear of heredity." But it is not so. There may be other causes of immunity besides the hereditary, but the idea of the inherited deficiency is not thereby affected. It remains.

But, although man is subject to the same hereditary disability as the ox, the hindrance to applying the same means of outbreeding the stock is almost insuperable in the case of man. It means a regulation of marriage, and an enquiry into antecedent personal history, which is at variance with all our ideas of the rights of life, and with sentiments that are held so dear that there is no possibility of their being voluntarily surrendered, or compulsorily set aside. So many would be affected, and the birth-rate, whose late rapid fall is a source already of appropriate national anxiety, would be immediately so reduced that we should be a rapidly declining nation. For if it be true that tuberculosis could be outbred in this country in fifty years, it is equally true that a general abstention from the act of reproduction, for an equally short period, would effectively wipe out the nation. The appearances of the moment from causes such as the so-called feminist movement, the desire for a selfish life of pleasure, the altering habits in regard to stimulants, the taking into charge of mental deficients, the fear of reproducing hereditary taints, or special susceptibilities, all indicate that within another decade the problem of maintaining the national numbers will be of prime political importance.

Apart from the want of tissue immunity, the scope of action is limited to protecting the individual body against possible attack, always remembering that the deficiency of immunity is of all degrees, and that whether the person dies of tuberculosis or not, will depend most often upon the circumstances of his life. There may be some so prone to develop the disease that their chance of escape is very remote, but for the main part

this is not the case. Economy, as well as humanity, demands that the best possible shall be made of every human unit that has been born into the world. Therefore, we want to employ the best means of warding off possible attacks of tuberculosis in order to keep the units of the community free from the misery and early death occasioned by the disease, and the body politic free from having to maintain chronic invalids incapable of self support during their decline.

We will now discuss the difficulty of preventing existing stock of tuberculous strains, or of low immunity developing the disease. It is a matter of infection primarily. We suppose that where there are no tuberculosis microbes there can be no disease of this kind. Secondly, it is a matter of the circumstances of life which affect the body so as to diminish what degree of immunity it may possess, and so render it more open to attack.

It appears manifest that the point of first value and necessity is to estimate, so far as possible, the degree of want of immunity, or the relative chances of developing tuberculosis in each person, in the time of youth, by a careful and specific enquiry into family history, and a regard for the type of child, as it presents itself to the medical inspector, with a view of warning the subject, and directing it into a career best suited to its physical powers and liabilities. This is a most difficult task. First, there are the limitations and peculiarities of the observer. Because in practice it is found that, amongst medical inspectors, in a question of making such a practical estimate as is here required, a good many are subject to peculiarities and prejudices which render their reports unreliable as exact statements of actual conditions. In the correctness of their observations all are limited. But even when the soundest differentiation possible as between those more and less liable to develop the disease is made, many difficulties present themselves in connection with the circumstances attending the present life of the child, which will prevent the course prescribed being followed. You can do no more than open the eyes of guardian and child to the danger, unless prepared to adopt the far-reaching and unnatural proposition of Plato, and remove all children from the care of their parents into national custody, which we may put aside as a dream.

The hindrance of unsuitable occupation seems, therefore, likely to continue, and to be a constant exciting cause of tuberculosis. As at present, so to a chief extent in the future, the unsuitability of the trade will only become evident when the case of tuberculosis has been produced. The patient will have been trained to that occupation as a means of livelihood. His only chance, provided that the disease has been discovered at its first onset, is to give up his business, which will commonly ruin him,

and greatly reduce his productive value as a unit in the State. In fact, the greater chance is that from that time he will become a burden upon others, and a minus quantity in the sum total of national values.

Apart from the deleterious nature of his business, the non-immune person is liable to be subjected to other circumstances that tend to bring on the complaint by their general effect upon his bodily condition. The broader and narrower influences of climate, altitude, and geographical and geological locality have an effect. Is it possible to prevent all tuberculous-disposed persons living in places exposed to damp winds, and upon low-lying wet ground, and can all those who inhabit such places and who show the first signs of phthisis be removed to more suitable localities, and never be permitted to return to their former homes? What, also, of the street or locality and the houses in which they live, and of the quantity and quality of their food and drink? Irrespective of their status in life, can all these circumstances be altered so as to be made most suitable to the individual's special requirements? Can the conditions under which the poor live be altered to those most sanitary, and in all ways advantageous, which pertain to ample means? How can it be done? Will State aid come in to such an extent as to enable it to be said to the poor consumptive, "You must quit your trade, and house, and place of residence. Go and live on Cleeve Hill, in a good house in comfortable style, and do not attempt other work than what we prescribe. Do this perpetually, and consider the means supplied"?

Will it be done through the Insurance Act? I fear the hindrance is too considerable. What of the family life that is broken up if the patient be the mother or the father? What of the dependants? Is it likely that tuberculosis can be put an end to by the half-methods of the Insurance Act? Is not the present process wasteful and ineffective? I fear that the methods cannot be really preventive because they are not radical. They do not touch the point of immunity and non-immunity, the fundamental liability. They only deal with the cases after the disease has struck, and produced its signs and symptoms, and when the necessity of cure has been added to that of prevention.

After the disease has made considerable advance before being recognised, the disease microbe has become widely established. There is irreparable injury to tissues, the patient is crippled whatever may be his circumstances. Permanent arrest of the disease by any applicable means requires recognition of the disease at a very early stage. It is a waste of the sanatorium provision, and probably of any sort of provision, to admit advanced cases to the institution with a view to cure, or to attempt to

cure them outside. Authenticated cases are mostly such, some are sent to the sanatorium and some to country cottages, and attempts are made to treat some by open-air shelters in small yards or gardens, when they would be much better in their beds, and all in vain. The doctors know that such treatment of advanced cases is useless and wasteful; but then, what is to be done? Is it best to make a show of doing, and of being of active service in this way, or to more calmly accept the inevitable permanent disablement of the patient, with following death soon or presently, and to do nothing but what may add to his comfort and relief?

No direct means of preventing the initial development of tuberculosis in likely persons is at present being adopted, nor indeed has this important part of the subject received much attention; also, no one can pretend to a knowledge of any means of cure, or of amendment greater than a temporary checking of the disease processes, excepting possibly in some cases taken in the initial stage. To discover and correctly diagnose cases in the initial stage is proving extremely difficult, and a great hindrance to their treatment, whilst still in this stage. Sometimes the patient treats the initial symptoms lightly, sometimes purposely hides them, on account of the prejudice against him and his family that the declaration of the disease evokes.

We may now turn to the difficulties that present themselves in preventing the presence of the causing germ. It can hardly be said that the prevention of the presence of the tubercle bacillus is less hopeless than the outbreeding of the low immunity, or removal of non-immune persons into those ideal surroundings where what power of immunity they may possess will have the best chance of asserting itself. Let it be granted that the disease could never arise but for the introduction of the microbe. Why not then destroy the microbe and so prevent the disease? To this at the present time there are very effective hindrances. There is no known means of killing the microbe when it is within the tissues of the body. It cannot be destroyed by the administration of any known drug or disinfectant, and the effect of tuberculin in this connection is extremely uncertain. The fact of its commonest seat being in the lungs, those vital organs of respiration that require to exhale foul matters at every breath, and, by coughing and sneezing, to violently exude whatever may be causing irritation within their passages, prevents the possibility of its being controlled. It is sneezed and spat and coughed and breathed out everywhere. We all of us have the microbe in our nostrils and mouths repeatedly, and are saved from its possible effect so long as our natural powers of resistance against it, or our immunity by which we can kill and avoid it, remains good enough. The infection of this disease is

less controllable than other infections on account of the chronic length of the complaint, and its subacute and gradually destructive effect. The more acute infectious diseases cure themselves or kill the subject, and are so brought to an end within a few weeks. In passing they confer an immunity against a second attack upon those they strike. It is not so with tuberculosis, the effect is local rather than general, of an organ, rather than of the blood and of the whole body. Tuberculosis does not cure itself by the process now called vaccination, or if it does so the mode and circumstances are partial and obscure. Hence the average length of the duration of a pulmonary tuberculosis case is perhaps three years, during a great part of which time the patient in going freely about attending to his business and his pleasure, in shops and public places. Under these circumstances our efforts at disinfection after death of places where such patients have been, and of things they have touched, is, it must be confessed, feeble and futile, and done more to sooth disquieting fear than for any sound preventive purpose. When a patient has saturated his house and family with the infection for two or three years, and then dies, the place and things may be partially disinfected, and cleansing of the house ordered, but in honesty one can but recognise that the real virtue of the performance as a preventive measure is little more than a mockery. Whilst he is alive we give him a spitting flask, and admonish him and his family as to the infectiousness of the complaint, and as to how he should comport himself, but to no great preventive purpose. He is then in the midst of his family, who are saved by their own immunity from the disease if that be strong enough to save them, which rather commonly it is not. They are of the same breed as himself if he is the parent, which magnifies their liability.

The prejudice against employing tuberculous persons is growing in strength, and even if physically capable of returning to his old employment after treatment for this disease, the unfortunate patient may find his way blocked by the employer refusing to take him back, and in the case of many kinds of employment, the employer cannot be blamed. In fact one of the irrational sides of sanatorium treatment is that patients are commonly turned back upon the public whilst in an infectious and dangerous state, after a stay in the institution varying from some weeks to some months. Failing to be again accepted in his old employment, the poor consumptive is driven into the ranks of casual labour.

To those least familiar with the position will come at once the thought, Why not remove such infectious cases to an isolation hospital, and so protect the public? Their number is too many; the length of their

illness too long; the expense of their maintenance too heavy; the deprivation of their liberty too severe. To be shut up in an isolation hospital for six weeks on account of an acute fever is bearable; to be so imprisoned for years, during a large part of which time the prisoner is in acute enjoyment of his faculties, can neither be borne nor proposed. The hindrance to the diminution of tuberculosis caused by the very free circulation of the infection is therefore likely to continue, though by considerable effort, a large expenditure of money, and a willing compliance on the part of infected persons to propositions as to their behaviour and removal from home, the infection abroad may be slightly lessened.

After contemplation of this wide diffusion of the infective material of tuberculosis from the human subject, the effort being made to diminish the introduction of the microbe derived from other than human sources may appear of secondary import; but as the probable chief cause of the tuberculous diseases of childhood, which are responsible for many deaths and much damage, is derived from milk, the recent action of the Government in the direction of insuring that milk shall be free of the microbe of tuberculosis is of considerable interest. But here also we find very serious hindrances to the intended good effect.

The Order of the Board of Agriculture which has just come into effect, and which is to be seconded by the provisions of the Milk and Dairies Bill, provides for the exclusion from milk-producing herds of cows suffering from signs of tuberculosis of the udder, or of tuberculosis with emaciation when these are discovered. But the limitations of the action, and the labour and difficulty of carrying out the complex provisions, will defeat the required object, which is to prevent any milk being sold that contains the tubercle bacillus. This microbe can be demonstrated to exist in the mixed milk of any large dairy, and is consequently constantly being consumed by all classes of the populace, and specially by infants, who are at first dependant upon milk for their whole feeding. Those whose immunity against the germ is weak are picked out for attack, the comparatively unsusceptible escape, the least immune die.

The new provisions, costly as they will be to put into operation, are not in the least likely to result in milk being henceforward free of the microbe of tuberculosis, since it is estimated that 30 per cent. of all milking cows are affected to some extent, in one part or another of their bodies, with tuberculosis. Experiments by Stanley Griffith, recently published in the Journal of Pathology and Bacteriology, prove that tubercle bacilli injected subcutaneously into the cow are carried in the circulation round to the udder, and stay permanently in the milk sinuses multiplying there

indefinitely, and so infecting the milk without producing of necessity any disease in the udder of the animal, which simply becomes a permanent carrier of tuberculosis microbes. Other scientists, acting independantly, have obtained practically the same results. From such experiments it may be presumed that every cow, of the 30 per cent. of all cows, is liable to give milk containing the microbe in whatever part of the body the disease with which it is affected may be situated. If this indeed be true, the partial action of the Government to diminish the danger in milk by compulsory slaughter of cows suffering from tuberculosis of the udder, or from tuberculosis with emaciation, will be almost futile, and the hindrance to the prevention of this source of the disease will remain as pronounced as in the case of the human source.

By J. MIDDLETON MARTIN, B.A., M.D., D.P.H.

PERHAPS, of all diseases, tuberculosis is that which has caused the greatest diversity of opinion, and even now, after so much work has been done in the investigation of the disease from every point of view, clinical, historical, bacteriological, experimental, epidemiological, and administrative, the latest authoritative statement is that "existing knowledge of tuberculosis . . . . . . is far from complete, and further discoveries of an important character may be anticipated."

Within the recollection of most of us, it was taught that consumption was an hereditary disease of nutrition, and it was not until the epoch-making discovery by Professor Koch, only thirty-one years since, that suspicions of its infective character were confirmed. Probably, however, the greatest light has been thrown on the wide distribution of the disease, not by a study of the cases and observation of the fatality, but by investigation of post-mortem records. Some of the results are given in the following table, and with them are compared the proportions of children reacting to tuberculin in various groups of children :—

	P.M. 848 deaths.	Von Pirquet. 988 consecutive pts.	Monti & Hamburger. 509 in infectious hospitals.
1st year of life... ...	15	16	?
2nd „	40	24	9
3rd and 4th year of life	60	37	27
5th and 6th „ ...	56	37	51
7th to 10th „ ...	63	57	71
11th to 14th „ ...	70	68	94

As the result of the examination of 174 children in Paris it was found that 82 per cent. of those aged 7 to 15 years reacted to tuberculin.

Professor S. Delépine, in his memorandum to the Treasury Depart-

mental Committee, says, "The evidence which has accumulated during the last twenty-five years, in this and other countries, shows that over ninety out of every 100 persons who have passed the age of thirty, and belong to the classes resorting to the hospitals, display post-mortem evidence of having at one time or another been infected by tubercle bacilli, but that most of these persons have recovered, or at any rate have not been killed by tuberculosis."

It does not follow that all these cases presented clinical symptoms of tuberculosis, and it is probable that even on careful examination in very few would it have been possible to find any physical signs. This is borne out by the results of medical inspection, in the course of which less than one per cent. of all routine children were diagnosed as tubercular; during medical inspection in some areas, however, as high proportions as 2·4 per cent. and 4·9 per cent. of children have been reported as presenting signs of tuberculosis. These unusual results would appear to have confirmation in the evidence of the above records, and the difference between the various examiners is mainly what is considered clinical evidence of tuberculosis. The important point is that in European countries tuberculosis is probably a common affection of childhood, and consideration of this fact must influence us in our measures for dealing with the disease. Interesting confirmatory evidence in the nature of a control experiment was given by Professor Metchnikoff in his Lady Priestley Memorial Lecture, in the course of which he refers to the disastrous effect of the introduction of tuberculosis amongst races previously free from the disease, and the comparative infrequency of tuberculin reactions of the inhabitants of the central region of the Steppes compared with those living at the periphery.

Inquiry into the comparative prevalence of illness due to tuberculosis as demonstrated by the death-rate shows that there has been a considerable diminution in many countries, especially during the last forty years, as is evidenced by the fall in the death-rate from pulmonary tuberculosis in England and Wales from 2·04 per 1,000 in 1876-80 to 1·11 in 1906-10: similarly, in the Registration County of Gloucester, the death-rate has fallen from 1·55 per 1,000 in 1881-90 to 1·09 in 1900-9 and to ·95 in 1910. The statistics for the Administrative County (*i.e.*, excluding the cities of Bristol and Gloucester) are not available for a sufficiently long period to show such a decline, but during the past 17 years it has been considerably below the above figures, averaging about ·87 per 1,000.

This satisfactory decline is attributed to the improved conditions of living, both as individuals and as communities, and to the increased segregation of infective persons: by the former, powers of resistance to disease

have been increased, and by the latter the opportunities of infection have been diminished. Assistance in the latter connection has also been given by the education of the public by lectures, exhibitions, leaflets, newspaper articles, etc., and of patients by special instruction both at home and in sanatoria.

There is, however, another aspect of the question which cannot be left out of consideration, and that is whether or not an acquired or natural immunity is enjoyed by certain communities. It is well known that one attack of an infectious disease confers on the individual considerable immunity to that disease, and this appears to hold true for tuberculosis, such for example as the protection against pulmonary tuberculosis which seems to be afforded, for instance, by tuberculosis of the glands or of the skin in early life. In this connection, Professor Metchnikoff quotes his own case. When he was twenty-three years of age, he married a lady of the same age who was suffering from grave pulmonary tuberculosis at that time, and died four years later; he passed the greater part of that time by her side in the greatest intimacy, without taking any precaution against the contagion. His immunity he attributed to an attack of ophthalmic scrofula which was completely healed and disappeared when he was young, and said he still had ganglia in his neck which are probably of bacillar origin. There would appear to be grounds for believing that the attacks of tuberculosis, evidenced by post-mortem results, from which so large a proportion of the population suffer in childhood, described by Professor Metchnikoff as "natural vaccination," account in considerable degree for the immunity of civilised races compared with those amongst which tuberculosis was formerly rare. If this acquired immunity is reduced by the measures we are now contemplating in the campaign against tuberculosis, the duty of using our utmost endeavours to control all centres of infection is enormously increased.

The present campaign against tuberculosis is the outcome of public opinion, and has been given practical shape by a series of General Orders of the Local Government Board making tuberculosis a compulsorily notifiable disease and empowering local authorities to treat it, and the provisions of the National Insurance and Finance Acts, 1911, under which funds have been provided for the treatment of tuberculosis. In view of the last, a Departmental Committee was appointed by the Treasury "to report at an early date upon the considerations of general policy in respect of the problem of tuberculosis in the United Kingdom, in its preventive, curative, and other aspects, which should guide the Government and local bodies in making or aiding provision for the treat-

ment of tuberculosis in sanatoria or other institutions or otherwise." Their first report was issued in May, 1912, and the second and final report in the early part of this year. In these reports are outlined principles of treatment and prevention which have been gradually evolved by the labours of numerous workers in all parts of the world. In spite of errors of the past, or because of them, the time has come when it can be said (Final Report, p. 13, para. 37) "existing knowledge of tuberculosis had sufficiently advanced to justify an expenditure of large sums of money in order to provide treatment and to prevent the spread of the disease." Before outlining their scheme the Committee refer to the influences which have adversely affected the success of treatment in sanatoria in the past, namely:—

1. The ignorance of the public concerning the significance of early symptoms. 2. The lack of facilities for early diagnosis. 3. The admission to and continued treatment in sanatoria of unsuitable cases. 4. Ineffective or insufficient after care. 5. The fact that so many sanatoria have been unable to attract the services of medical officers possessing expert knowledge of the work, and that in consequence many sanatoria have been conducted as convalescent homes rather than as institutions in which effective treatment has been given.

In the course of the last nine months, nine further circulars, orders, and memoranda have been issued from the Government Departments, and a member of a local authority may well ask amidst all these official directions, "What are our duties?" Among the most important of these documents is the Tuberculosis Order of the Board of Agriculture and Fisheries, dealing with tuberculous cows and tuberculous milk; while in the Milk and Dairies Bill, now before the House of Commons, is another measure which also aims at the prevention of the production and sale of tuberculous milk.

It would therefore appear that provision has been made for attacking the disease on all sides, and that by making use of all available knowledge we can do much to reduce very greatly the prevalence of tuberculosis. It is not sufficient, as some have given the impression, to push any one method to an extreme without due consideration of others, and to this is to be attributed some of the difficulties in getting schemes adopted. Others than myself must have heard objections raised in protest against doing anything, that the claims advanced by the medical profession are not realised, and that the profession does not yet know what are the proper measures to take.

We are probably agreed on the statement of the Departmental Com-

mittee that existing knowledge has sufficiently advanced to justify the campaign, with prospects of considerable success, remembering that if by so doing communal immunity is thereby reduced, there is the greater obligation to increase our vigilance in controlling centres of infection.

The scheme of the Departmental Committee may perhaps at a meeting in Cheltenham be fittingly instanced by what has already been done and what has been suggested for this county, practically on the lines proposed in their report. It is gratifying to note that the city of Gloucester has identified itself with the interests of the county as a whole, and has joined with the county in the scheme for the treatment of tuberculosis. Up to the present time neither the City Corporation nor the County Council has decided to treat non-insured persons, but the arrangements made and the work being done are to all intents and purposes parts of a scheme for the treatment of the whole community.

This scheme includes measures for prevention, for as was stated in the Circular of the Local Government Board of the 16th November, 1911, the prevention of infection and the treatment of the patient frequently cannot be separated.

The Gloucestershire scheme is as follows:—

1. *Educational Methods.*—The Insurance Committees have already availed themselves of their powers by contributing to a successful Tuberculosis, Nursing, and Cookery Exhibition, held at the Shire Hall in October, 1912, which has been recently supplemented by a tour of the tuberculosis caravan. The District Councils supply leaflets to patients, and the Education Committee include courses of instruction in hygiene, etc., in the schools, which might be extended with advantage, and employ one health lecturer.

2. *Investigation of Cases.*—In accordance with the recommendations of the Local Government Board, it is proposed that the dispensary staff shall perform this duty, acting, while doing so, under the directions of the Medical Officer of Health.

3. *Housing and Disinfection.*—The inspection of houses and the superintendence of disinfection are duties of the local sanitary authorities.

4. *Treatment and Assistance.*—While under the Public Health (Tuberculosis) Regulations, local sanitary authorities have very wide powers, it is understood they will be exercised in general co-operation with the scheme. The two units of the scheme of the Departmental Committee are (1) the Tuberculosis Dispensary, and (2) Sanatorium, Hospitals, etc.

(1) *Tuberculosis Dispensaries.*—The original proposals included the establishment of 19 dispensaries and proportionate staff, but when the

amount of money available for sanatorium benefit was reduced, the number of dispensaries was also reduced to nine: it is probable it will be found desirable as a result of experience to establish small branches or visiting stations as circumstances indicate. The joint committee were fortunate in securing the services of Dr. Guy, who commenced his work as tuberculosis officer in this county on the 1st January, 1913, and the first whole-time tuberculosis nurse will come early next month. So far five dispensaries have been opened: two in connection with general hospitals, one at a provident dispensary, one at a working men's institute (where we have three rooms), and the fifth at the offices of a district council. Up to the present time district nurses have attended at the dispensaries where Dr. Guy examines patients and decides the form of treatment in each case. Some cases are treated at the dispensaries, while others are referred to their usual medical attendants, and some are sent to the sanatorium. Among the duties of the tuberculosis nurse are:

(*a*) Noting the conditions under which each patient is living. (*b*) Obtaining the history of each patient and the relatives. (*c*) Seeing that the directions of the tuberculosis officer are carried out. (*d*) Encouraging suspects to attend for examination. (*e*) Keeping in touch with voluntary agencies. (*f*) Informing the medical officer of health of results of inquiries when he desires specified information.

Shelters are supplied for use at home in cases where they can be conveniently erected.

(2) *Sanatorium, Hospitals, etc.*—(*a*) *Sanatorium.* The Joint Committee have been fortunate in having a sanatorium in an ideal situation available in the county, in Cranham Woods, about seven miles from Cheltenham, Gloucester and Stroud. 70 patients have already been admitted to this Sanatorium, and there are now twenty-two patients in residence. Arrangements have been made for an increased number of beds.

(*b*) *Hospitals.* The provision of beds for patients who are not suitable for the sanatorium, and for whom there is no proper accommodation at home, is now our greatest need. It is proposed that they shall be erected in connection with existing isolation hospitals, and I understand that this suggestion has already the approval of four hospital authorities in this county, although they have not as yet been formally approached.

(*c*) *Residential School for Children.* A suggestion has been received from an adjoining county for the establishment of a joint residential school for two or more adjacent counties, and this would probably be the most economical and convenient arrangement for providing for the children in need of special and prolonged treatment.

(*d*) *Provision for Surgical Cases.* Beds for surgical cases could be most simply arranged in connection with existing general hospitals, and proposals in this direction have already been made.

It will be seen from the above that though the scheme is as yet far from complete there exists a ground work on which a most useful organisation can be built. With the complete scheme of the Departmental Committee, and effective arrangements for utilising the powers under the Tuberculosis Order of the Board of Agriculture and proposed under the Milk and Dairies Bill, administrators will have at their disposal for battling with tuberculosis, machinery of dimensions greater than has been devised for coping with any disease, and it will only remain for them to use it effectively. What will be the outcome time alone will show: there is reason for considerable hopefulness, but the total abolition of tuberculosis can scarcely be expected except as the result of hard work for very many years, and it is to be feared that the sanguine expectations which some people have formed of seeing the end in their time are doomed to disappointment, yet with hearty co-operation of all concerned it is almost inconceivable that, before we pass on our share in the work to our successors, fruits of our efforts will not be evidenced by promises of a great reduction in the prevalence of tuberculosis.

DR. F. KINCAID ETLINGER (Pinewood Sanatorium) said the value of sanatorium treatment had been questioned, and was generally, but quite unjustifiably, allowed to be a matter of opinion. The chief points, which were sanatorium treatment, the placing of the patient under open-air conditions and the regulation of rest and exercise and of diet, had been proved to be of the greatest value in all cases of consumption, but it had also been proved to be insufficient by itself in a considerable number of cases. It was only in the very early cases that it would, unaided, do all that was required, but in all cases it must form a part of treatment, and the background, as it were, to other special measures. The latter was partly on account of its own intrinsic value, and partly because none of the special measures could be used satisfactorily or safely unless the patient was under constant observation.

The treatment for each individual case must be separately selected, and experience has shown that if a proper discrimination was exercised the most valuable and satisfactory assistance could be obtained by the expert use of modern special measures.

Of these, perhaps, the most important was the administration of tuberculin, which, in the hands of competent persons, had produced good results in suitably selected cases, and particularly when combined with sanatorium treatment.

In some cases great assistance was obtained by the use of special vaccines for the secondary infections which co-existed in the large majority of cases of consumption.

Further, the recent insistence on the value of graduated labour was justified by results, and it was supposed that this depended upon the regulation and induction of what was called auto-inoculation.

Last, but not least, there were various surgical measures of extreme importance, and it could not be too emphatically urged that in this country these had not received the attention which they undoubtedly deserved. The most important of these were firstly, the compression of the most affected lung by the production of a pneumothorax with nitrogen gas, by Forlanini's method; and secondly, the collapsing of the chest wall in order to obliterate cavities or to control persistent haemoptysis, by removing pieces of the ribs both in front and behind by Wilm's method; thirdly, the possibility of operating directly on the affected lung, and even of removing a lobe or more, which had been brought within reach by the introduction in this country, by Morriston-Davies, of an apparatus for regulating the pressure inside the lungs, and thus preventing collapse when the pleural cavity was opened.

All the special measures, and others, were of the greatest value in suitable cases which were under sanatorium conditions. The fact which needed emphasis was that we ought really to speak of "treatment at a sanatorium," and not of "sanatorium treatment," which latter was in itself only half the story. The use of the latter term instead of the former was one of our "hindrances," and the Insurance Act, in so far as it related to the treatment of consumption, had a tendency to delay progress and to act as a hindrance, by setting the official "hall-mark" on sanatorium treatment, *per se*, as the recognised and all-sufficient cure for the disease.

Invaluable aid to treatment had been given recently by the X-rays; so much so that it might be said definitely that at the present day it was not justifiable to undertake the treatment of consumption without this assistance. It enabled the diagnosis of the situation, the extent and character of the disease, to be made with far more accuracy than was possible by physical examination alone, and it enabled the progress of the case, and the anatomical results of treatment, to be watched and recorded with very much greater exactness.

With the help of that aid and of the special methods, combined with sanatorium treatment, a much larger proportion of cases came within the category of curable, and at the present day there was no need for an up-to-date and properly equipped sanatorium to exclude all except the earliest cases.

It was impossible to lay too much stress on the fact that the principle of competition was a great hindrance to progress. The forming of opinions as to which of the several aids was the right one was not what they wanted, but rather the scientific use of a combination of the several measures which had been proved, each of them, to have their value in some instances limited.

The same thing applied in the after care of cases of consumption, where an open-air life was so apt to be insisted upon to the exclusion of everything else. As a matter of fact, regularity of life was by far the most important consideration, and that was nowhere more difficult to obtain than in country occupations, the adoption of which were so frequently insisted upon to patients whose work hitherto had been in a London office. Practically all country occupations were extremely irregular, depending on the seasons, the weather, etc., whereas the daily routine of an office was excellent in this respect; and it was a matter of experience that sensible patients who were allowed to return to their former office work, had every bit as good, if not a better, chance of keeping well, as the man who was condemned to look for unprofitable and irregular country work, for which he had no special aptitude and of which he had no technical knowledge.

Dr. Dryburgh Gold (Hereford C.C.) was inclined to think that the separation of the hindrances from the aids had given Dr. Garrett's remarks an unduly pessimistic tone. It was quite true that the present-day use of tuberculin could not be looked upon as an unfailing specific. If it were, there would be no call for the extensive campaign which was being elaborated. There was hardly any doubt that great enlightenment as to the disease and steady advance in its treatment must follow on the efforts which were being put forth. Nobody should look for the disease being suddenly exterminated, but it seemed to him there was a great likelihood of its steady decline on account of the many ways in which it was being tackled. It was likewise highly encouraging that the death-rate showed such a tendency to fall.

He was of opinion that one or two of the statements made by Dr. Garrett were applied too generally, and this was the case with reference to the utility of shelters. All cases, he admitted, could not be placed in shelters with the same advantage; but there was no doubt as to the great benefit which would accrue to early and suitable subjects suffering from the disease. He also had spoken as if disinfection of houses was somewhat futile. Dr. Gold did not agree, as he considered it highly advantageous that a house, subjected to a long infection and being a distinct danger to subsequent occupants, could, by conscientious disinfection, be rendered safely habitable. As Dr. Martin had detailed to them the scheme in operation in Gloucestershire, he would like to say that the scheme adopted in Herefordshire followed on much the same lines. They were establishing nine dispensaries (one or two more than might have been thought necessary), owing to the scattered population and extensive area. These would be under the control of the tuberculosis officer.

Dr. J. Guy (Gloucestershire Tuberculosis Committee) drew attention to the well known fact of the steady decline of the death-rate from tuberculosis. He argued that the forces in operation which had brought about this fall, if attended to, were likely to still further reduce the death-rate; excluding the idea that

this fall in the death-rate was due to our becoming immune, he showed that the main factors were the general sanitary measures which had been brought into force during the last fifty years. He pleaded not so much for more research, but for practical application of the present knowledge that had been acquired from research. The two main problems to be dealt with were first, the general ignorance of the laws of hygiene, and secondly, an economic problem which prevented proper housing accommodation and a sufficiency of food.

DR. W. M. HOPE (Gloucester) contended that unless something were done to improve the housing of the people it was not of much use to spend money on sanatorium treatment. If public money could be found for the one object it must be found for the other. Tuberculosis was not nearly so infectious as some people imagined, and in this connection he warned all concerned against creating an unnecessary scare, the only result of which would be to deprive patients who had been in sanatoria of all chance of getting future employment. He favoured open-air classes in all schools.

MR. A. E. HUDSON (Cheltenham) said that in Dr. Martin's paper reference was made to the fact that in this country during the last 50 years consumption had been diminished by 50 per cent.

The greater part of this enormous shrinkage in the extent of the disease, could not be ascribed to any special means of repression such as notification, tuberculin dispensaries, isolation in hospital, or disinfection of sputum and dwellings. It was during those 50 years that general sanitation, aimed specially against no disease in particular, was established and became active in their midst, and the diminution of the death-rate from this disease was in the main due to the better housing and better feeding of the people.

Among the many influences which aided in the spread of consumption, few were so important as overcrowding, especially indoors. Under such circumstances the power of resisting the disease was greatly lessened, whilst the chances of infection were as much increased; and when, in addition, they found damp soil and walls, want of light, poor internal ventilation, and interference with circulation of air without, the risks were enlarged. It was well known that overcrowding was the greatest help to the spread of tuberculosis from person to person, and they all knew that overcrowding in cities, and in cottage homes, was one of the most pressing problems in connection with tuberculous disease. Where overcrowding was reduced tuberculosis diminished. The history of barracks, ships, workhouses, asylums, prisons, schools and other public institutions, brought vividly before them the connection between overcrowding and tuberculosis.

Some few years ago the Liverpool Corporation cleared away some insanitary areas, and erected under good and appropriate conditions of construction 2,400 dwellings, and these were let exclusively to the former tenants of the demolished

area, or to tenants who had been dispossessed from equally insanitary dwellings in the vicinity. Most of the tenants were in an extreme condition of poverty. At the time these insanitary areas were condemned the average death rate among these people from phthisis was four per 1,000. The death-rate has now fallen to 1·9 per 1,000, the most material difference in their circumstances being a change from a dwelling that was unfit for human beings to live in, to a dwelling that is fit, together with such alterations in their social habits as ensue from that change, for people generally rise in some degree to the level of the houses they occupy.

No branch of the crusade against consumption was more important than the sanitation of the dwellings, especially in the case of the poorer classes, where the majority of these cases occurred. In Cheltenham, 67 per cent. of the tuberculosis cases notified had been from houses let at 5s. 6d. per week and under. It was the overcrowded dwellings of the poor that were the real breeding places of tuberculosis; it was out of them that the disease always cropped up anew, and it was to the abolition of these conditions that the energies of the local authorities and their officers should be directed if it was desired to attack the evil at its root. It was impossible for many of the poorer classes to pay sufficient rent to secure dwellings with the necessary cubic space for healthy existence. So urgent was the need for housing reform, so certain was that reform to yield immediate results in the reduction of tuberculosis, that many persons were of the opinion when sanatorium benefit was first proposed, that the millions which it was proposed to devote to it, might, in the long run be far more profitably expended in improving the housing of the people.

Dr. Herbert Jones (Herefordshire Combined Districts) mentioned the curious fact that wherever he had found a high death-rate from cancer there was a low death-rate from consumption, and *vice versa*. He considered it a great mistake to change the occupation of consumptive patients: it was much better to send a man after sanatorium treatment back to his office than to dig in a garden or even to any lighter work to which he was unaccustomed. The aids to the diminution of tuberculosis were those which assisted sanitary administration generally, just as the hindrances were those which prevented the proper carrying out of the laws of health.

Mr. J. S. Pickering (Cheltenham) said the public at the present time were being led to expect some wonderful cure for this insidious disease in the provision of sanatoria for its treatment. If it could be eliminated by that means no one having any regard for human suffering and the good of the community would count the cost too great. But unless it was really believed by members of the medical profession that what was now being advocated in that direction would have that effect it would save a good deal of mental suffering to the afflicted if they could be informed of the limitations of present-day knowledge

with regard to a cure, rather than that they should be led to anticipate a condition which could not be realised.

Speaking at a meeting of the Sanitary Institute twelve months ago, the county medical officer of Stafford expressed the opinion that sanatorium treatment should, as a rule, be looked upon as being educational rather than curative, and the retention in the institutions should only be for a time sufficient to train the patients as to how they should live at home in order to encourage recovery. It was very evident that Dr. Reid realised the limitations of the treatment which could be given in sanatoria, and he pointed out that insured persons were possibly expecting more in the direction of institutional treatment than it would be justifiable to give under a wise policy. The provision of sanatoria was touching only the fringe, as it were, of an exceedingly complex problem, and there appeared to be at present no decided opinion among medical men as to the means to be adopted to meet the numerous difficulties which presented themselves in dealing with the subject from every point of view.

One of the chief hindrances to the effort to eradicate or diminish tuberculosis was to be found in the want of proper housing accommodation for the poorer classes, and it was open to question whether the large sums of money to be expended on sanatoria could not with better advantage be devoted to the provision of suitable dwellings for those whose circumstances compelled them to live in overcrowded and insanitary areas, and under conditions which gave every facility for the spread of the disease it was sought to eliminate. If sanatoria were considered essential, why should they not be built in an inexpensive manner as supplemental to garden villages provided specially for the patients? The suggestion for using these institutions as a means of training patients as to how they should live in the special homes provided for them could then be carried out under the best conditions. Moreover, it was probable that such an arrangement would be a means of inducing many sufferers to willingly exchange their overcrowded surroundings for the more congenial environment which would thus be provided, whereas they might, under ordinary conditions, enter an ordinary sanatorium with reluctance; and it must not be overlooked that there was no compulsory power to require patients to participate in sanatorium treatment, even on the ground of public safety. Whatever might be said of the suggestion, it could not be denied that no suitable and complete scheme for dealing with tuberculosis had been placed before the public, and it was to be feared that vast sums of money were about to be spent on sanatoria which could only deal with the matter in a very imperfect manner.

Dr. S. T. PRUEN (Cheltenham) pointed out that according to the statistics of the previous speakers, and he had no hesitation in accepting them, tuberculosis was a disease which our tissues were able to resist much more successfully than was generally supposed. They had just heard that ninety per cent. of the population had, or had had, tuberculosis in one form or another, and yet the

death rate from it was ·09 per cent. This meant that out of 10,000 people who had the disease, only one died from it.

If we confined our attention to those who obviously had the disease, the death rate became a serious matter. In the management of these cases, the most serious difficulty was the after-treatment of those coming from sanatoria, and in this after-treatment the great practical difficulty was the food. It was far better for a man to return to unsuitable employment with good wages than to suitable employment with poor wages. He could always live in the open air for at least fourteen out of each twenty-four hours; but without money he could not buy the necessary food. What was required was a committee of ladies] in each district, who would themselves learn how to buy the most suitable food in a cheap form, how to cook it appetisingly, and then teach what they had learned to the tuberculous convalescents.

Dr. Mabyn Read (Worcester) said that Dr. Garrett stated that because the effort to control tuberculosis was in front of our knowledge of its causation, the expenditure would be waste and the attempt doomed to failure. That line of argument had been refuted all along the path of medical science. No one who had had practical dealing with the problem of tuberculosis could fail to take a hopeful view of the matter. But the chief need was for the education of all concerned, the medical men, the sanitary committees, and, most of all, the citizen. Without intelligent co-operation on the part of each patient, of the employers, of the general public, the work of the tuberculosis officer would be hard. The lessons to be learnt by the public in dealing with this problem were good for the healthy as well as for the sick.

Modern Methods for the Purification and Softening of Water Supplies,

by JOSEPH PARRY, M.Inst.C.E., Chief Engineer, Liverpool Corporation Waterworks (MEMBER).

Read at Sessional Meeting, Chester, May 30th, 1913.

BY modern methods, I assume is meant recent or present methods; for we must admit that all methods of purification practised to-day are comparatively modern. It is only about eighty years since the first artificial filter bed was made at the works of the Chelsea Water Company.

There are at least two excellent reasons for the serious discussion of this matter: one is, the increasing difficulty of obtaining supplies of water from unpolluted sources; the second is, the changes that have taken place within the last few years, and are still taking place in the treatment of impure water.

Slow filtration through beds of sand is still the prevailing practice in Great Britain, and I commence by describing the latest filter beds constructed for the Liverpool Corporation, not as necessarily representing the best practice, but as embodying the views, seven years ago, of one who has studied the subject and has had the management of filter beds for more than forty years. My design of seven years ago does not, however, exactly represent what I would do to-day.

The cross section exhibited shows the arrangement of the filtering material in the last bed added to the Oswestry system for treating Vyrnwy water. The catchment area from which the supply is derived is very thinly populated, and is remarkably free from risk of pollution; therefore, the chief object of filtration is the removal of colour and of particles in suspension.

The aqueduct between Lake Vyrnwy and Oswestry terminates at Llanforda in a reservoir, from which the raw water is drawn on to the filter beds. When it reaches the filters it first enters a gravel chamber formed at one end of each filter and running its entire length. The water enters at the bottom of the chamber, passes upwards through the gravel bed, and then falls in thin sheets on to the sand bed through depressions in the division wall. As the gravel chamber retains a considerable amount of suspended matters it becomes clogged in time, and when it requires cleaning it is restored to efficiency in a few minutes by passing a rake through the bed and opening a sluice valve, at the end of the chamber, through which the wash-water is discharged.

The sand forming the filter-bed is obtained from a natural deposit in a millstone grit outcrop found in the neighbourhood. It is all

washed and passed through a copper-wire screen of one-eighth mesh to the inch, and retained on a screen of fifty meshes to the inch. The thickness of sand used is 2 ft. 6 ins. Below the sand, and supporting it, is a layer of 9 ins. of graded gravel, lying on perforated tile drains of a special design. These perforated earthenware tiles cover the whole floor of the bed, and from them the filtered water enters the main drains leading to the outlet well, where the output is measured, through a disc gauge, before being discharged into the clear water tank. A diagram attached to a clock-driven drum records the quantity passing through.

The average rate of filtration in these beds is about 2½ million gallons per acre per day, or a vertical flow at the rate of between 4 and 5 ins. per hour. The actual rate varies from time to time according to the colour and turbidity of the water as affected by seasonal changes and rainfall.

When a filter has been shut off and the level lowered for scraping, or emptied for resanding, it is refilled to above the sand surface with filtered water from an adjoining bed, and is then filled to overflow level from the unfiltered supply pipe. This arrangement prevents any unfiltered water being sent on to Liverpool.

There are three qualities of sand in use at Oswestry, in different beds: one being the natural deposit above referred to; the second an artificial sand produced by crushing a local grit stone; the third, a crushed quartz sand from the Minera district. The best results in reduction of colour have been obtained from the natural deposit.

The number of filter beds at Oswestry is twelve, and the total sand area approximately ten acres. Each unit is 0·81 of an acre, or 31,413 square yards.

At the Rivington works of the Liverpool Corporation, in Lancashire, there are eight filter beds with a total sand area of six acres. Six of these filter beds were made by Thomas Hawksley sixty years ago, and are still doing excellent duty.

There are also at the Chorley works of the Corporation five small beds, two of which, forming part of the original works, were made for a private company by Mr. J. F. la Trobe Bateman in 1846, and the other three added by me for the Corporation in 1884 and 1900. The beds designed by Mr. Bateman in 1846 are interesting as being the first within my experience to provide for removing the surface-film by scouring.

It was in connection with the Chorley works that I first introduced a gravel strainer through which to pass the raw water before delivering it on to the sand bed. The strainer was provided in the form of a trough. It answered so well that I decided to apply the same principle to all

future filter bed constructions, and hence the gravel chambers at Oswestry. Experience there has suggested still further improvements which may be applied hereafter.

Dégrossisseurs or roughing filters have been added to many ordinary sand filtering plants, and the improvements effected of late years, especially by Messieurs Peuch and Chabal, as seen in operation at Paris and elsewhere, have been exceedingly useful in prolonging the periods between scraping in the final sand filters. It is strange that more general use has not been made of preliminary filters, having regard to the number of years which have elapsed since the idea was first put into practice.

In addition to the ordinary filter beds of the Liverpool Works, I have from time to time during the last twenty years had a number of small experimental filters in operation at Oswestry to test the value and efficiency of different kinds of filtering materials and at different rates of filtration. Instructive information has been obtained from these tests, and I hope some day to find time to tabulate and publish the results.

The general efficiency of the filtering plant at Oswestry and at Rivington is tested both chemically and bacteriologically in the following manner:—1. A monthly chemical analysis is made by the city analyst of samples drawn from every source of supply. 2. A monthly bacteriological examination is made by Professor Beattie, of the Liverpool University (successor to the late Sir Rupert Boyce, F.R.S.), of the several sources of supply, and a daily bacteriological examination of the water as delivered in Liverpool.

As an example of Professor Beattie's results, I give a copy of his latest Report:—

DAILY EXAMINATION FOR WEEK ENDING 10TH MAY, 1913.

	Bacteria present per cc.		Bacteria present per cc.
4th May	5	8th May	11
5th "	11	9th "	17
6th "	17	10th "	12
7th "	13	Average for seven days	12·28

MONTHLY EXAMINATION FOR MAY, 1913.

	No. of bacteria present per cc. in five monthly samples of water.
Green Lane Well (new red sandstone) ...	36
Dudlow Lane do. ...	17
Rivington Supply	7
Vyrnwy Supply	10

In all the above samples colon bacilli absent in 50 cc.

The washing of the sand scraped from the surface of the beds is an

important operation in all filter installations. It is effectively and economically done at both Rivington and Oswestry, by means of washing machines of my own design, which time will not permit me to describe.

For many years the question of mechanical scraping has occasionally occupied my thoughts, and I have made a number of preliminary sketches of devices which engagements of a more pressing character have prevented me from completing. Slow sand filters cannot be regarded as complete until they are so constructed and managed as to render unnecessary the employment of gangs of working men in the beds, manipulating and turning over the sand through which the filtrate is to pass. That I do not consider the problem impracticable is shown by the fact that I have made provision for running a mechanical scraping plant in the last two beds constructed for the Chorley supply.

In addition to the sand filters connected with the ordinary water supply, there are in Liverpool filters specially designed for the filtration of salt water from the River Mersey for use in the public swimming baths. Most of these are built up with layers of coke, gravel, and sand for upward filtration, and they produce a bright limpid water, which gives general satisfaction. At one of the baths where the ordinary form of bed could not be applied, a polarite filter has been put in.

I refer to this particularly because I have had a small experimental polarite filter in operation at Oswestry for several years, and I have also experimented with a very similar material, Spencer's magnetic carbide, which was originally invented to meet complaints of objectionable colour when the supply was first brought to the city in 1857. Spencer's carbide was used in several towns, notably at Wakefield, in Yorkshire, where it produced a really marvellous effect on the foul water of the River Calder.

Nowhere has the subject of water purification received greater attention of late years than in the United States of America. There the problem has been complicated by the large amount of finely divided clay carried in suspension in many of the large rivers, necessitating the use of precipitants and settling basins prior to filtration. Investigations have been conducted and results published which have been of great value in affording guidance as to the treatment of different classes of water, and the relative cost of different kinds of plant. Especially are we indebted to the Massachusetts State Board of Health for a large number of valuable experiments commencing about the year 1890, and continued to this day. At an early stage they commenced studies on ordinary slow sand filtration, double filtration and mechanical filtration with the aid of coagulants, and they have made systematic studies on the relative efficiency of filters of equal

depth, and containing sand of the same effective size, but operated at different rates.

To them we are also indebted for the expressions, "Uniformity coefficient" and "Effective size of sand grain," being, I think, the first attempt to discover a scientific basis for the purpose of comparison. Their experiments on the frictional resistance of sand to water at various temperatures were also very useful.

The practical outcome of the investigations made in the United States is to be found in the slow sand filters of Albany, Washington and Philadelphia, and the mechanical filters of Louisville and Cincinnati.

The American practice differs chiefly from that of Great Britain in the necessity for dealing with the large amounts of very finely divided clay particles carried in suspension in many of their rivers, and also because of the effects of high summer temperatures and the rapid growth of organisms. Out of this state of things has been evolved the iron and lime process, as applied to the supply of St. Louis from the River Mississipi before filtration through sand. Important improvements have also been effected in the United States in the manner of handling and storing dirty sand, and of returning it to the beds after washing.

On the Continent of Europe, the practice, as seen in the examples of Hamburg, Berlin, Zurich, and Antwerp, does not differ materially from that of England.

The most important discoveries of recent years in connection with the purification of water have been those of Dr. Houston, with regard to the effect of sedimentation on the destruction of pathogenic bacteria. These are described with admirable fulness, lucidity, and candour in his research reports, and in the annual reports of the Metropolitan Water Board.

I have hitherto only referred to slow sand filters. With regard to mechanical filters, there is the difficulty that the number of makers, and of patents more or less valid, is legion. I believe they all date from an ingenious device patented in the United States about the year 1884, the special feature of which was the addition, in a closed vessel, of a coagulant or precipitant, by means of which the impurities in the water were more quickly arrested.

It is stated that there is among English engineers a prejudice against mechanical filters. I have seen no evidence of this, and anyhow I claim to be entirely free from it. There is undoubtedly a prejudice on the part of the public against any chemical treatment of the water they are to drink, and a preference for water in its natural condition from unpolluted sources.

There is no system of purification which is of universal application. The object of all systems is to provide, in the words of the Water Works Clauses Act of 1847, a "pure and wholesome" supply for the consumers.

In selecting the particular method of filtration to be adopted in any particular case, regard must be had to the quality of the water to be treated, and the character and degree of purification desired. There is no infallible remedy for all kinds of water ailments.

What is the standard, then, whereby we are to determine the suitability of a water supply for domestic consumption? Until recently the only standard, except that of taste and appearance, was the chemical standard. We know how unsatisfactory that generally was; how hopelessly conflicting and contradictory the opinions of experts; how incapable the chemists were and are of detecting many substances fatal to health and life. The science of bacteriology has provided a new and more rational standard, but there is a distinct danger of the determinations and figures given by bacteriologists being misapplied and their significance exaggerated.

It is by no means certain that the removal by filtration of a large percentage of micro-organisms is conclusive evidence of purity and wholesomeness. Nor is it proved that in the process of removing all bacterial life from water, useful and beneficial bacteria may not be eliminated as well as those that are harmful.

I do not wish in any way to depreciate the importance and value of the discoveries of bacteriology, but we ought to be on our guard to avoid drawing unwarranted conclusions from the teachings of a science that is admittedly only at an early stage of development. Let us not commit the error of regarding it as if it had attained to full and complete manhood.

There is one practical point on which I want to lay some emphasis in regard to the reports of bacteriologists. It is the practice of giving the results of analyses in percentages of reduction instead of giving the full actual numbers. This course is often very misleading and always very indefinite. Take as an example a raw water from a sewage polluted river containing 10,000 bacteria per cc. A reduction of 99 per cent. by filtration would be considered a good result, and would leave in the filtered water 100 bacteria per cc. But take the case of water from a sparsely populated upland source with 50 bacteria per cc. in the raw water and a reduction to 10 bacteria per cc. in the filtered water. The percentage of reduction would be only 80 per cent. though the purity of the resultant water would be far higher. In all cases the analyses ought to give the actual numbers both in the unfiltered and filtered waters.

The Institute would render a most valuable service to the cause of water purification if it would establish standard methods of examination both for chemical and bacteriological analyses on the same lines as adopted by the Public Health Association of the United States of America.

At the annual meeting of the British Medical Association held in Liverpool last year, there was an important discussion on "The varieties and significance of *B. coli* in water supplies," when a resolution was passed as follows:—

> "That this conjoint meeting of the sections of State Medicine and Bacteriology unanimously desires strongly to urge that no opinion as to the quality of a water for dietetic purposes should be arrived at on bacteriological evidence without a local and topographical inspection of the sources of the supply made by a competent observer."

This is practically what I advocated in a little book on water in 1881.

My contention was, and is, that the first consideration should be given to the physical, geological and topographical conditions of the source of supply, and then to the chemical and bacteriological analyses of the waters.

The "Competent Observer," mentioned in the resolution, should be the engineer advising upon the scheme, assisted by the technical reports of the chemist, bacteriologist, and medical officer.

When in Paris some two or three weeks ago, I had an opportunity of examining the works for the filtration and sterilisation of the waters of the river Marne. The filters consist of, first roughing filters or dégrossisseurs and then ordinary sand filters. These produce an effluent which is exceedingly good, and after filtration treatment the water is lifted by pumps into a building where it is subjected to ozone treatment. The appliances have been installed by the General Ozone Company, and the system is partly that of the Siemens and partly of the Otto Company.

I was told that the plant was capable of dealing with 17,600,000 gallons per day, and that the water was completely sterilized. So far as I could judge by appearance the results were certainly highly satisfactory.

The subject I have been asked to discuss includes the softening as well as the purification of water supplies. In this matter my practical experience is limited to the Clark process, which I believe was the basis of all the processes in operation until the recent introduction of Permutit.

I am not satisfied that the Permutit process possesses any advantage over the old and well-established Clark process, and it appears to possess some disadvantages which require careful consideration in any proposal to apply it in practice; the presence of sodium bi-carbonate in the treated water, the regeneration of the Permutit by solution of common salt, the

solubility of the Permutit itself, and the risk of it passing into the treated water are points to be considered.

With the exception of the introduction of Permutit, recent improvements in softening appear to be almost entirely in details of plant and methods of application. Some of these show great ingenuity, and are a decided improvement on older methods.

A pure supply of water is so vital to the health and comfort of the community that, wherever reasonably possible, recourse should be had to unpolluted sources rendering unnecessary any subsequent treatment other than an open sand and gravel bed provides.

Mr. C. W. Bennett (Chester) said, of the numerous methods of water purification now in use, some of which had been referred to, slow sand filtration was the one which had stood the longest test of time, and which was most nearly akin to Nature's own process of percolation through the soil.

Advocates of the slow sand filtration method of water purification might be divided into two classes or schools.

In the first class were those who relied mainly upon the gelatinous film forming the filtering skin for the removal of the matter in suspension and chemical and bacteriological impurities. This filtering skin might be formed naturally by the impurities contained in the water, or it might be assisted in its formation by the addition of a coagulant. And in the second class there were those who placed little or no importance upon the filtering skin, but who, on the contrary, enormously reduced the chances of its forming, by removing the suspended matter which included gelatinous substances, by passing the raw water rapidly through roughing or pre-filters before turning it on to the slow sand filter. That class placed most reliance upon what was known as adsorption, or the attachment of the bacteriological and other impurities left in the water, to the sand, grain by grain, as the water descended through the filter.

There was much to be said for both methods, but his own experience led him to put chief reliance upon the first class, which to some extent embraced the second, as, provided the depth of sand was sufficient and the rate of filtration slow enough, any impurities which might have passed through the filtering skin were generally arrested by adsorption.

In working slow sand filters the *lower* the filtering head used, the *slower* would be the rate of filtration and the *greater* the *efficiency* of the filter from a purity point of view. But after the filter had been in use for some time the filtering skin became thicker, which retarded filtration, and to overcome this it was necessary to gradually increase the filtering head.

Up to this point the filter had continued to improve in efficiency from the day it was turned on, and subject to certain exceptions, it was only when a filter

became so choked on the surface that it was not passing a useful quantity of water, that it became necessary to clean the bed by removing the filtering skin.

Most authorities on sand filtration advised the same size of sand grain from top to bottom, but their own experience at Chester had led them to depart from the usual practice. Sea sand, and more recently sharp pit sand from Delamere Forest, was formerly used for the whole sand depth of the filter with excellent filtration results, but experiments showed that by interposing two layers of finer local sand a marked improvement, even on the previous good results, was obtained.

Consequently that formation had been gradually adopted in all the beds, and although sub-surface clogging was predicted by critics, and had doubtless taken place to some extent, it was insufficient to cause any inconvenience, and some of the beds were altered as much as fourteen years ago and continued to yield, if anything, improved effluents.

He agreed that percentage of reduction in bacteria by filtration was futile to express the sanitary purity of a water, but the percentage of reduction figure was useful to the engineer as a measure of the work a filter bed might be doing.

DR. ORR (Shrewsbury) stated that in recent years the use of pressure filters had much increased in popularity, and it behoved sanitarians to recognise clearly their possibilities. Pressure filters might be used with or without a coagulant; but whether it was a form of filter in which coagulant was used or not, it would appear that the results were much the same. The consideration of the use of pressure filters was governed by the quality of the water to be filtered. In the first place, one might have water which was bacteriologically pure; in the second place, water which was suspicious; and, thirdly, water which was certainly contaminated.

Included in the first was water which contained iron or colouring matter. For such a water, pressure filters appeared to be admirably adapted, being excellent filters of suspended matter and colouring matter. If the water was bacteriologically pure (that is, free from sewage contamination), and no storage was therefore required, pressure filters were a great saving in expense, and nothing more was required as regarded purification.

As regards suspicious or polluted water, the filters alone were not suitable. The danger from polluted water was water-borne disease, chiefly typhoid, and to free the water from typhoid bacilli one must have sufficient storage of the water before filtration. Provided storage of sufficient length were given, a suspected or contaminated water could be so purified by pressure filters as to be rendered a potable water. If storage was not of sufficient length (and the length of time required was at least three weeks, as indicated by the experiments of Dr. Houston of the Metropolitan Water Board), then the filters would fail to make the water a potable one. Water was not dangerous on account of the number of organisms, but on account of disease-producing organisms present. Storage

for a sufficient length of time killed off the dangerous organisms, such as the typhoid bacillus.

The filters removed only a certain percentage of organisms. The speaker had had two kinds of filters under observation, giving 76 and 87 per cent. average purification respectively, and if in the percentage remaining there happened to be any dangerous organisms, then disastrous results were apt to follow. Take, for example, the presence of glucose-fermenting or coliform organisms in the water. The original source of the water in both cases was a polluted river containing usually about 6,000–7,000 organisms per cc., and giving glucose-fermenting organisms in 1 cc., or one-tenth cc., but not in one-hundredth cc., while the filtered water contained these organisms in 10cc., but not in 1 cc. If such organisms gained a pathway through the filters then *B. typhosus*, which belonged to the same group, would be allowed through.

He was of opinion that if pressure filters were to be used for purifying a suspicious or polluted water there must be sufficient storage previous to the filtration. But if the water was beyond reproach as regards bacterial pollution, and filtration was simply to remove suspended matter, or if water contained iron or colouring matter, then these filters acted as efficient and inexpensive purifiers.

As regards bacteriological analysis he had only a few words to say. He considered certain methods of examination had now been almost uniformily adopted, but there was no uniform method of interpretation of the results. The index of pollution which caused most controversy was *B. coli*. The term *B. coli* was used as a generic term, and observers were inclined to apply the term excretal *B. coli* to a certain organism, but he could not find that this organism was any more entitled to the term excretal than any of the others. He preferred to use the term glucose-fermenting organisms for the whole group, and was inclined to believe that they were all excretal in origin. Similar organisms were found in animal and human excreta, so that the significance of the presence in water of the organisms of this group was not the same in all cases. He pleaded for the abolition of the term *B. coli* applied to the group, the term to be applied to the specific organism described by Escherich, and the substitution of a general term, such as coliform or glucose-fermenting group.

Mr. Coard S. Pain (Liverpool) said he approached the discussion from the point of view of the change that had taken place in the interpretation of the words "pure and wholesome." With the advance of civilisation those commodities which formerly were accepted without question were now viewed in a more critical spirit, and some thought with too exacting a tendency.

The too enterprising manufacturer traded on their credulity, and furnished them with various kinds of comestibles composed of other substances than what they thought they were buying, but which through skilful manipulation they were unable to detect either in taste or appearance. When these compounds

proved too undesirable from dietetic or from other reasons, a check was put on imitations by the Food and Drugs and similar Acts of Parliament.

And in similar though not in the same way, the public was formerly content to drink rain water from the roofs, stored in tanks and cisterns, or water obtained from wells, and those at times very near cesspools and other sources of pollution, without further requirement than that of its being pure and wholesome in appearance and taste.

Now the public require that the water supplied should neither choke their pipes with lime; nor cause their boilers to burst in consequence of lime incrustation; nor be short of lime, so as to encourage rickets; nor take up lead in their pipes and cause lead poisoning. In other words, a quality of water was demanded that should be neither too hard nor too soft, and if the natural state in which it was found fell short of those requirements, the providers were expected to adopt means to satisfy the advanced requirements.

At first sight it might seem hard on the provider, who had not anticipated any change in the definition of "pure and wholesome" that had been generally accepted when the works were undertaken, and whose profits would be seriously diminished thereby.

On the other hand, the consumer was entitled to consideration, inasmuch as the provider, under the powers granted by Parliament, was protected from invasion of the territory secured, enjoyed a monopoly, and could not be touched by competition, even though a more desirable supply might be within easy reach of the consumer's dwelling.

Having regard, therefore, to the existence of a monopoly on the one hand and to the interests of public health on the other, Parliament was now requiring the provider to do what was necessary to render the public supply of water free from undue hardness or softness, and free from deleterious matters in suspension.

DR. RENNET (Chester) said there ought to be some central body to look after the water of the country as a whole, and to preserve the desirable watersheds for the use of different communities. The most important advancement in water purification was in the direction of sedimentation, which was an absolute necessity if there was any doubt whatever about the purity of supply. If the water was taken from a river with the possibility of occasional pollution, sedimentation should be insisted upon. The bacteriological results of purification ought to be stated in total numbers and not in percentages, and he did not think that standardisation had gone as far as it might go. Purification by ozone appeared to be a reliable method when a proper plant was adopted and the water was suitable. He doubted if a water with a considerable organic content, say peat, could be satisfactorily purified in that way.

Dealing with the question of soft water as the cause of rickets, he denied that it was so. It was a matter of diet, want of fat, and absence of warmth.

DR. FRANCIS VACHER (Birkenhead) said in the early times when he opened a laboratory the testing of a water sample was quite a simple matter. Some general statement as to its quality was made, judged by taste, colour, and suspended particles; the permanent and temporary hardness were ascertained by the soap test. Finally the percentage of albuminoid ammonia was also found and reported. According to his experience it was unusual for more than those few particulars to be required.

At present the public wanted to know more about the water they drank. They asked for particulars as to the source of a supply, and expected full chemical and bacteriological reports at regular intervals.

He was pleased to hear Mr. Parry say that all methods of purification of water were comparatively modern, and that engineers had been working on the same lines for many years, because he remembered that in the days of the West Middlesex Water Company (of which his father was a director) a very good standard of purity used to be reached and maintained. Sand filters were still largely trusted for the removal of colour and suspended matter. The roughing filter too, which was a very old invention, was as much in favour as ever. Again, as to softening, nothing seemed to be better than the Clark process.

MR. JAMES WILDING (Runcorn) said something should be done to standardise experiments and analyses. They had heard a great deal about the softening of the water from pumped supplies. One of the greatest difficulties that people had to deal with in in this connection was the commercial side.

There were many expert commercial engineers who were constantly experimenting with the softening of water to enable those authorities whose purses were not large, or who were not within reach of the supplies from the upland sources, to deal with the supply at their disposal on some satisfactory basis. The chief requirement of the pumped water, particularly from red sandstone, was softening, and some of the problems arising in this respect had been up to the present too hard to remedy.

A valuable work would be done by a study of the permanent hardness of pumped water, so that smaller authorities could be helped to deal with their difficulties. The purity of water was perhaps the first factor which entered into the government of all towns, and water which might be all right in analysis from a dietetic aspect might be objected to by manufacturers on account of hardness. Although a great deal had been said and done on the question of water softening, a great deal more required to be done in the way of invention and discovery, before town supplies could be looked upon as satisfactory when the water was softened.

He welcomed any invention which would soften water in such a way that the ordinary public would not take fright, and leave it soft enough for commercial purposes. It was a very important question to small authorities.

DR. MEREDITH YOUNG (Cheshire C.C.), speaking of hard and soft water, said he was one of those who believed that acclimatisation to water was just as necessary as it was to air and other conditions, but so far as his own observations went the acclimatisation appeared to be only one-sided, because people who transferred themselves from a hard-water area to a soft-water area did not appear to suffer, whereas those who transferred themselves from a soft water area to a hard water area had, at all events in some instances, suffered from gastro-intestinal derangements and other minor ailments. A scientific observer who resided in Manchester, where the water supply was of a soft character, frequently went for week-ends and holidays to a bungalow in a hard water area in Cheshire. After a couple of days in the hard water area he and his two children suffered from goitre, which was quite manifest in all three cases. On their return to Manchester this condition disappeared in two or three days, but invariably recurred when they returned to the hard-water area.

Dr. Young quoted a unique instance of the effects of hard water which had been disinterred from the report of a French Commission by Prof. Glaister.

In a town called Bozel there was a population of 1,472 people. Of this population no fewer than 900 had goitre and 109 were cretins. The Bozel water supply was hard and contained sulphates of calcium and magnesium. At the neighbouring village of St. Bon, which was only 1,100 yards away and higher up, the water supply was soft. The authorities concerned laid on the St. Bon water to the village of Bozel, and 16 years later the number of persons suffering from goitre at Bozel was reduced to 39, and the number of cretins to 58. These were the principal facts, and in the absence of other evidence one could not say exactly that the case had been one of cause and effect. Still, the figures were sufficiently large to permit of a considerable margin for error and still remain of a striking character.

He had long ago urged the opinion, which had apparently been reached by Mr Parry, to the effect that an examination of the surroundings of a water supply was of much greater importance in judging of the purity of the water than either a chemical or bacteriological examination. As regards bacteriological examinations, he also quite agreed that there was a need not only of standardisation of methods, but of the formation of a proper scheme of examination. In the case of chemical analyses, a more or less agreed form for report had been reached, and a precisely similar form for bacteriological examination was needed. Without pretending to be a bacteriological expert he ventured to suggest that a scheme somewhat on the following lines would be found useful:—

1. Total bacteria per 1 cc. growing on nutrient gelatine at 20° C.;
2. Presence and number of bacillus coli reacting to the *flaginac* tests;
3. Presence or otherwise of bacilli enteritidis sporogenes;
4. Presence or otherwise of streptococci; and
5. Presence or otherwise of pathogenic bacteria.

Coming to local powers, he was of opinion that the local authority, in cases where the supply was furnished by a Water Company, should be given powers to take samples of water, on giving proper notice to the Company, from any part whatever of the Company's works, and they should have the power of entry for this purpose at all reasonable times. The samples should be taken in triplicate, as under the Sale of Food and Drugs Act, and should also be taken in the presence of some officer of the Company.

Dr. Gilbert Fowler (Manchester) asked Mr. Parry whether he had had any experience with the trickling water works filter, experimented with successfully by Miquel and Mouchet in France, and, he believed, by Major Tulloch in this country. Such filters were said to be safer in some respects than the ordinary water works filter, owing to the absence of water pressure on the surface.

With reference to mechanical high-pressure filters, he might refer to a statement recently made by Mr. H. Heap, in a paper to the Manchester Section of the Society of Chemical Industry, that small quantities of aluminium salts in a water greatly increased its action on lead. That showed the importance of very careful control of the addition of coagulants.

He had seen something of the use of ozone on the Continent; but recent experiments at the Manchester University on the action of ultra-violet rays on sewage indicated that in certain respects the use of ultra-violet rays was likely to be more economical than the use of ozone, inasmuch as the rays were found to destroy the bacteria without affecting the inorganic matter.

In regard to analytical methods, he was inclined to think their data were too static. While a given analysis might be difficult to interpret, chemical and bacteriological analyses, carried out simultaneously by different observers, at, say, a series of points on a river, had been found in his experience to correspond closely, even though taken alone the chemical differences might be very slight.

He thought it was important that bacteriologists should, if possible, find some means of distinguishing between recent and old pollution. In India, Major Clemesha had been able to differentiate in many cases between bacteria indicating different stages of pollution, by their varying resistance to sunlight. Such a method might hardly be possible in this country, but some means should be found, for if too strict lines were drawn it might be difficult in some country villages to get any water to drink under present conditions, and it was not always immediately possible to instal a proper water supply.

Dr. W. R. Ormandby (Manchester) remarked that Mr. Parry said he had very little experience of the Permutit plant, but that he would require information regarding the possible solubility of the material, and the suitability from the health standpoint of a water containing bi-carbonate of soda in place of lime and magnesia salts before he could recommend it.

The latter point was a question for the medical officers of health. There was some divergence of opinion among medical men, but for town supply the plant enabled one to soften any proportion of the water down to zero, and then to add such proportions of the town's water untreated as would bring the hardness to any required degree. This was effected without the danger of subsequent chemical reaction tending to the production of further precipitates.

With regard to the solubility of the material, plants had been in use for about three years, where the loss had proved to be less than 1 per cent. per annum; that was due to the removal mechanically of very fine particles.

The plant gave no unpleasant and unsightly residues, such as were produced by the soda-lime treatment, and it was uninfluenced by seasonal or other variations in the composition of the water.

It was known that manganese hydrates were better germ catchers than either alumina or alumino-ferric precipitates, and it was also known that such manganese hydrate precipitates, in the presence of traces of permanganate solution, were wonderfully efficient sterilisers of water. Unfortunately, such treatment resulted in the presence of manganese in the effluent, and it had hitherto been impossible to work under those favourable conditions for bacteriological purification as no adequate means existed for the removal of the manganese. The Permutit Company devised a plant which was capable of removing every trace of iron and manganese in solution from water supplies. Two 9-ft. cylinders sufficed for the removal of iron from 1,000,000 gallons of water per day, with a simple and cheap regeneration about once a month.

MR. LASSEN (London) particularly drew attention to Dr. Houston's eighth research report dealing with the excess lime system. The experiments in the laboratory had been eminently satisfactory, and a trial carried out on a large scale by one of the big Scottish municipalities had proved that Dr. Houston's theories did not only hold good in the laboratory, but also when carried out on a large scale. The Metropolitan Water Board had decided to carry out experiments on a large scale with Thames water. The whole trend of development in this particular line proved that the Clark process, far from being effete and old-fashioned, was holding its own, and new features not known before had given it an almost greater importance than it had previously.

OBITUARY.

JOHN LUBBOCK, the first Lord Avebury, was born in London in 1834. By his death, on May 28th, we have lost one of our oldest Fellows, his connection with our Institute dating from 1876. He was a Vice-President from that year to 1888, and from 1906 onward, and was a Trustee from 1882 to 1888. Other and older societies have had his name on their roll for a still longer time. For instance, the British Association from 1853, and the Royal Society from 1858. He most fitly held the Presidency of the Selborne Society for many years.

He succeeded to a baronetcy in 1865, and perhaps will be best remembered as Sir John Lubbock, for it was under that title that so much of his public work was done. He was created Baron Avebury in 1900, taking his title from a place hallowed to all antiquarians.

He was educated firstly at home, and afterwards at Eton, and though he entered into business very early, losing all the advantages of college-life, he was for many years closely connected with the London University in distinguished capacities: firstly as its Vice-Chancellor from 1872 to 1880, and then as its Member in the House of Commons for some twenty years.

In electing him that University did itself honour, daring to go outside the pale of its own graduates to take a man whose talents and character pre-eminently fitted him for a university representative, though he had no university career.

He was also appointed Lord Rector of St. Andrew's University in 1907.

Lord Avebury was a man of great general knowledge, making a name as a banker, as a politician, as a naturalist, as an antiquary, and as a writer; and in all things he was governed by the wish to help in any cause that advanced the knowledge and the well-being of mankind.

To a sanitarian his great merit, indeed, must be his constant readiness to take part in any movement tending to improve the condition, bodily and mental, of his fellow men; and it is perhaps from his work in this line that his name will live "in our fair island story." The creator of bank holidays should ever be remembered.

There is no need here to give details of his work; that has been done often already, and will be done in the publications of the various scientific societies in the work of which he took part. It is enough now to note that through several of his books many people must have been led to appreciate scientific methods, to value scientific research, and to take up some branch of scientific study themselves.

The writer looks back with pleasure to his friendship with Lord Avebury, which began in the early days when, as Mr. Lubbock, he was first a candidate for parliamentary honours in the University of London, but was beaten by Robert Lowe (afterwards Lord Sherbrook). Besides his high character as a public man, in every sense, Lord Avebury was also one of the most charming hosts, drawing folk toward him by his good humour, his kindness, and his companionable nature. It may, indeed, be said of him that he had many friends, but no enemies. W. W.

NOTES ON LEGISLATION AND LAW CASES.

These notes are copied by permission from The Law Reports published by The Incorporated Council of Law Reporting for England and Wales. For full text of these see Law Reports, which can be referred to in the Library of the Institute.

ADULTERATION.—*Milk—Deficiency in fat—Milk not of the nature, substance, and quality to be sold—Milk not tampered with—Sale of Food and Drugs Act, 1875 (38 & 39 Vict. c. 63), s. 6.*

The respondent was charged on an information with having consigned to a purchaser milk which was not of the nature, substance, and quality contracted to be sold, the milk being deficient in fat to the extent of 26 per cent. of the minimum amount fixed by the sale of milk regulations, 1901. At the hearing the facts stated in the information were proved or admitted, and evidence was also given and admitted that another consignment of the same morning's milk from the same cows showed on analysis fat 3·1 per cent. (being in excess of the said minimum), and that the morning's milk from the same cows seven days later showed on analysis a deficiency of fat below such minimum of 3 per cent. only. The justices, on this evidence, were of opinion that although the sample, the subject of the summons, was not of the nature, substance, and quality contracted to be sold, yet the respondent had not tampered with the milk, and that the milk was as it came from the cows. They accordingly dismissed the information:—

Held, that the case must be remitted to the justices to convict the respondent, unless further evidence was given before them bearing upon the question whether or not the difference between the qualities of fat in the two consignments of the day in question was consistent with there having been ordinary milking.

Marshall v. Skett.

ADULTERATION.—*Deficiency in fat—Milk not tampered with or adulterated—Public Health—Food and Drugs—Genuineness of Milk—Milk sold in condition as yielded by cow—Deficiency of fat due to method of feeding—Sale of Food and Drugs Act, 1875 (38 and 39 Vict., c. 63), s. 6—Sale of Milk Regulations, 1901 (1) and (2).*

The Sale of Food and Drugs Act, 1875, s. 6, makes it an offence to sell any article of food "which is not of the nature, substance, and quality demanded" by the purchaser. The Sale of Milk Regulations, 1901 (1) and (2), provide that where milk contains less than a percentage of milk fat and solids, it shall be presumed for the purposes of the Sale of Food and Drugs Act, 1875 to 1899, until the contrary is proved, that the milk is not genuine by reason of the abstraction therefrom "of milk fat or solids," or the addition thereto of water.

In a complaint the offence charged was that of "selling sweet milk that was

not of the nature, substance, and quality of sweet milk," the article demanded by the purchaser, in respect that "it did not contain the percentage of milk fat and solids required by the regulations," contrary to the Sale of Food and Drugs Act, 1875, s. 6, and to the Sale of Milk Regulations, 1901.

It was proved that the milk did not contain the percentage of milk fat and solids required by the regulations; that it had not been tampered with or adulterated, but had been sold in the same condition as yielded by the cows; and that the deficiency of milk fat and solids was due to the method of feeding, which had been purposely adopted to produce quantity of milk irrespective of quality:—

Held, that the milk was genuine, and that the accused was not guilty of the offence charged.

Smithies v. Bridge (1912) 2 K.B. 13, commented on. SCOTT v. JACK.

HOUSING.—*Local Government Board—Powers and Duties—Appeal from Local Authority—Housing, Town Planning, &c., Act, 1909* (9 *Edw.* 7, *c.* 44), *ss.* 17, 39—*Housing of Working Classes, England, Rules, January 11, 1910, rr.* 1, 4, 5, 9.

By s. 17, sub.-s. 6, of the Housing, Town Planning, &c., Act, 1909, if, on the application of an owner of a dwelling house, a local authority, which has made a closing order under sub.-s. 2, refuse to determine the order, the owner may appeal to the Local Government Board.

By s. 39 of the Act the procedure on any such appeal shall be such that the Local Government Board may by rules determine, provided that the rules shall provide that the Board shall not dismiss any appeal without having first held a public local inquiry.

By rules made under this section it is provided that every appeal to the Local Government Board shall be made to and brought before the Board by means of a letter or other representation in writing, and that the Board shall not dismiss an appeal without having first held a public local inquiry:—

Held, that the Local Government Board is not bound to hear an appellant or any one on his behalf after receiving the report of their inspector on the inquiry, and before dismissing the appeal.

Observations of Madden, J., and Wright, J., in *Rex v. Local Government Board* (1911) 2 I. R. 331, approved and applied.

Held, also, that a properly authenticated order of the Local Government Board made upon an appeal is evidence that the appeal was considered and decided by the Local Government Board, or by some person properly appointed to hear it for or on behalf of the Board, until the contrary is proved.

THE KING v. LOCAL GOVERNMENT BOARD. Ex parte. Arlidge. K.B. Vol. I., Part IV. April, 1913. 463.

Volume XXXIV. No. 7. Issued August, 1913.

JOURNAL

OF

THE ROYAL SANITARY INSTITUTE

CONGRESS AT EXETER.

INAUGURAL ADDRESS

By The RIGHT HON. EARL FORTESCUE, K.C.B.,

Lord Lieutenant of Devonshire,

Delivered July 7th, 1913.

THE Secretary reminded me, in forwarding an invitation that I should be President of this Congress, that my father had discharged that duty over thirty years ago.

I think I owe the honour you have done me quite as much to that as to any merits of my own. My father took a deep interest in sanitary affairs, and made great sacrifices for sanitary reforms.

I cannot put any such claims before you. In these matters I am only one of the men in the street who knows that a great deal has been done; is quite prepared to believe that there is a great deal more to do, and has only very vague ideas as to what ought to be done next.

Under these circumstances I cannot offer you an address that will be of any value as a contribution to sanitary science. I shall not do more than make a few remarks on the only sanitary questions of which I have any knowledge, namely, rural housing and the chain of responsibility in county administration for sanitary defects. I do not flatter myself that I shall throw much new light even on these subjects, but I may provoke contradiction, which at any rate is one way of stimulating discussion.

I should like to add that I wrote this paper in May last, before the recent political speeches on the subject were delivered, and before Mr.

Runciman had expressed at Bristol an opinion which seems to involve the expropriation of private owners of cottages, and the substitution for them of some central authority: the county council, I suppose, or a Government department.

It is commonly assumed that rural housing, by which I mean the dwellings occupied by the labouring classes in country districts, is generally bad; that the defects of country cottages are a main reason for the migration into towns and emigration to lands beyond the sea, which between them have so largely reduced the rural population; and that bad cottages, migration, and emigration are alike the fault of those convenient whipping boys, the many-acred peers and country gentlemen, and the obsolete feudal system which imaginative writers suppose still to exist.

There is no doubt one failing common to the majority of cottages in the country, that is *anno domini*, and being old they are often not up to modern ideas; but, broadly speaking, I think it is true that the bigger the landowner the better are the cottages, and *vice versâ;* and it is certainly the fact that in this county at any rate no class has a monopoly of the ownership of country cottages.

A good many are occupied by their owners, and these are very frequently in bad repair. A good many more belong to persons who own little else (it is not uncommon for old age pensioners to be landlords) the fact being that country people, knowing little of stocks and shares, prefer to put their savings into what they understand, a cottage or a little field, or both, and there are consequently a great many cottages that represent the life savings of people who have never handled as much as £1 in wages in a week.

These cottages are apt to vex the soul of zealous sanitary inspectors. But I doubt if the good or bad character of village dwellings has much to do with what is called the rural exodus, for whatever a man may gain in other ways by migrating to a town or emigrating to one of our colonies, improved housing is not an advantage that is surely to be obtained.

There was a Commission on the Housing of the Working Classes some 20 years ago, the importance of which was such that the then Prince of Wales, His late Majesty King Edward VII., consented to serve upon it. The evidence then received told of whole districts in London and other towns where the rule was one room to the family, lodgers often being taken in besides; and instances are quoted in their Report of cases where many persons of all ages and sexes made what I suppose was called a home in a single room of very moderate dimensions. That sort of thing is largely changed, but the census of 1901 (the figures for 1911 are not

issued yet) showed that there were over 54,000 one-room tenements in the United Kingdom occupied by anything from 4 to 14 persons apiece.

Bad as many rural cottages are, there are few occupied by families that have not two bedrooms of a sort, and rough as is the accommodation in some of them, it is a good deal better than what men put up with for the first few years of their work in the remoter parts of Canada and Australia; but then they recognise, and rightly, that the wages would not be so high out there if the conditions were more civilised, and they feel too that there are chances of rising in life which are absent at home.

The exodus from the country into the town is a very old story. The migration into the towns of country apprentices was forbidden by Richard II. and Henry IV., and more than 500 years ago an Act of Parliament passed in the seventh year of the latter monarch declared that the fields were deserted, and the "gentlemen and other people of the nation greatly impoverished" by the labourers seeking apprenticeship in towns, "and that for the pride of clothing and other evil customs that servants do use in the same."

It is needless to say that this Statute did little or nothing to check the practices at which it was aimed; and in James the First's time, two hundred years later, the question being still acute, somebody, 300 years in advance of his age, discovered that the shortage of houses in the country was the cause of rural depopulation, and prevailed on Parliament to pass an Act rendering any person liable to a fine who pulled down a cottage in the country.

In point of fact, the same movement from country to town is observable alike in England and in North America; in Europe and in the Antipodes; whether the land system is old fashioned or democratic; whether the government is monarchical or republican.

Denmark, foremost in progressive agriculture, has to import field labour from Poland; Germany, the model of ordered efficiency, cannot get in her harvest without the help of 800,000 aliens.

A Manifesto of the Labour Party in New Zealand printed in *The Times* of 23rd May last pointed out that "the farm labourer of to-day is the city labourer of to-morrow."

Mr. Roosevelt instituted a Commission for the rehabilitation of American rural life; and the United States Ambassador, himself an active member of that Commission, said only last month that in his opinion the chief aim of his people at this moment is "to restore *the country homes* of the masses to their place of domestic happiness and economic independence."

As Mark Twain remarks, there is a deal of human nature in man; and human nature being what it is, men will ever seek to sell their wares in the best market, whether their wares are their cottons or their hardware, their brains or their thews and sinews.

And here I may remark that pure physical strength seems to have a higher value in the town than in the country.

Farm labour promotes general muscular development in a way that tending machinery does not; but there are few acts of husbandry which are beyond the powers of a boy or of a woman. It is brains, not muscle, which make the best shepherd, horseman, or herdman; when, however, you come to handling goods for transport, or to the pick and shovel work of the navvy, muscle has a value of its own, and finds a market open to it which does not exist on the land.

Men leave the country villages to better themselves: to get higher pay or pleasanter conditions of life. I do not think they often do it simply and solely to get better housed, though no doubt it often happens that young people who are anxious to marry leave their native parish because they cannot find a vacant house in it; and though there were 108,000 empty houses last year in the exclusively rural areas of England and Wales,* there is at present in some parishes, perhaps in many, a shortage of labourers' cottages to which various causes have contributed.

If just conclusions can be drawn from the figures for the 105† registration districts which contain absolutely no urban districts or parts of such, however small, the rural population had slowly decreased for forty years prior to 1891, the fall having commenced with the introduction of machinery.‡ Since 1891 it has gone up 10 per cent., and is now not only substantially greater than it ever has been, but it is all but 50 per cent. more than it was in the "good old times" a century ago, notwithstanding all the labour-saving appliances now in use.

The decrease of population in the last generation would alone account for something, for the reduction culminated in a period when the return from agricultural land fell off lamentably, and there was little money available to replace worn-out buildings.

Within recent years, too, many of the old leaseholds granted early in the 19th century have run out, and repairing covenants in respect of cottages, being more honoured in the breach than the observance by the leaseholders, most of the dwellings that have come into hand are unfit for a new tenant without more outlay than they are worth.

At the same time there is growing distaste among agricultural

---

* Speech of Rt. Hon. J. Burns, *Times*, 13th June, 1913.

† One-sixth in number of the whole. ‡ See the Census, Vol. I., p. XIX.

labourers to lodge in their employers' farmhouses, so much spare accommodation is standing vacant in them; small holdings, too, have diverted some cottages from the use of wage earners to those of men who at busy times are wage payers. Simultaneously, the standard in cottage accommodation has been rising, and to meet it two cottages have often been thrown into one, or three into two: and there has likewise arisen a demand in country places for dwellings for week-enders and their dependants and servants. With all this the cost of building has gone up without any corresponding increase in the rents obtainable from rural workers: the loss on cottage building has grown greater.

More and more of the country labourers' wages have been paid in the shape of accepting a nominal rent for a 3s. to 5s. cottage, and employers in the country have been more and more inclined to defer building themselves as long as they could house their employees at the expense of a neighbouring proprietor.

I saw a striking example of this on a small scale in a Midland county estate with which I am acquainted. The area was under 750 acres, and there were 37 cottages on it; nearly treble or quadruple the number required for the labourers who worked on the owner's own farms, and all let (with two or three exceptions) at from 7d. to 1s. 6d. per week.

This meant, of course, in practice, that the cottage owner was paying a substantial part every year of his neighbours' wages; a fact that the neighbours have realised since most of the cottages have been sold.

It is of course as much a landowner's business to provide cottages for the men required to cultivate his farms as it is to provide shippens and stables for the live stock of the farms and sheds for the carts and implements; and the majority of owners do so.

The trouble is that it is nobody's business to provide dwellings for the village tradesmen, road men and artisans who work for the community at large; or for the jobbing labourers on whom the smaller farmers and *small* holders rely for assistance from time to time, and as in ordinary circumstances you make a considerable annual loss on every cottage you erect, nobody is anxious to build for people who, though necessary to the public, have no special claim on any particular member of it.

Take a case common enough: A man owns two farms in a parish and five cottages, four of which suffice for the labourers employed on the farms; why should he let the fifth for £4 to the thatcher or road contractor when he can get £8 for it from a summer visitor for his gardener or chauffeur?

The real difficulty in regard to rural housing seems to me to attach almost entirely to those whom it is not the business of anyone in particular

to house, the widows, the old-age pensioners, the artizans, the policemen, the postmen, etc.

Landowners, except the smallest, recognise, I believe, that cottages in fair proportion to the acreage are part of the equipment of their farms, and they no more expect to get that portion of the equipment provided by other people than the stables or barns; and when parishes are owned entirely, or very largely, by a single proprietor the housing of the general servants of the community naturally falls also on him; but when a parish is in the hands of many proprietors that doctrine cannot be applied, and if it be agreed, as I think it is, that it is desirable to get more people to live in the country, the only method by which the additional population can be provided for is to facilitate building by some such method as is proposed in the Rural Housing Bill.

I am far from wishing that this should be done indiscriminately. The system of paying a man partly in cash and partly by letting him a house for much less than its value is a thoroughly bad one. It tends to maintain a flat rate of money wages for the men, regardless of the skill and competence of the worker, and a flat rate for the cottages regardless of cost, accommodation, or situation. It underpays the good man and overpays the old and indifferent. It discourages the strong young man who only gets his 15s. without the advantage of renting a 3s. cottage for 1s. It fills up the village with widows and old-age pensioners, and often makes it very hard for young men to marry and settle.

The raising of agricultural labourers' wages to a figure which will enable them to pay economic rent and with it the grading of the rents of cottages (which vary much less than their quality) is a most desirable reform, particularly in the interest of the younger unmarried men, who are emigrating in such numbers and are just the class we want to keep.

Though there are few of them probably who could state their case accurately, yet they feel that they are being paid less than married men who can not do as good a day's work, and the injustice of it lends attraction to the high wages that are to be earned, though by very much severer labour, in Canada. It is likely to be several years, however, before cottage rents are put on an economic basis and wages raised to correspond, and I fear that the elderly men and those who are not quite able-bodied will suffer in the process. I hope that a suggestion made in the House of Commons as to something in the nature of almshouses for widows and old age pensioners will take shape at an early date.

Cottages with three bedrooms are indispensable for people with families, but they are not wanted for old couples and widows, and unpleasant as it may be for the latter to have to move, yet it is inevitable if house room is

to be found for young couples in the country parishes where vigorous young workers are badly wanted.

Provision of cheap accommodation for the aged and the widows by the help of the community, and of roomier houses for those general servants who can pay 2/6 and 4/- a week rent will, I think, meet the case, it being clearly laid down that neither great landowners nor small should receive assistance from public money in providing necessary equipment for their farms.

So limited, I think the task is not beyond the powers of our local authorities; if they go the right way to work they can often get the necessary land for nothing, and I do not believe the stories that they cannot get land for cottage building at a price that renders building possible, for the price of one-eighth of an acre of land is not much on the cost of a cottage, or on the rent payable to cover that cost.

There is a great difference between £25 per acre and £100, but the difference between 4 per cent. on £3 2s. 6d. and 4 per cent. on £12 10s. is under 2d. a week, and a demand for house accommodation which is choked off by that cannot be a very real one.

We should clear our minds of cant also about the question of tied cottages. There is a good deal said about the hardship to the labourer of the tied cottage system, but there is a good deal to be said likewise as to its necessity to the farmer.

The cottage let with a farm is often situated on it, and often is the only one near at hand: consequently the only place suitable for the cow-man or herdsman or shepherd who has to be on the premises early and late, and in the night, too, if there is sickness.

If the labourer can quit the farmer's service at a week's notice and still retain a building without which the business of the farm cannot be carried on, the farmer is as unfairly prejudiced as if his stables or barns could be taken away from him at a week's notice to accommodate some stranger's hunters or motor-car. He is deprived in either case of an indispensable portion of his working plant.

My ideas on the rural housing question, then, are: Let cottages at economic rents. Pay labourers accordingly. Leave landowners to provide what is required as equipment of their farms. Give the parish or the district facilities for providing what is required for the service of the community, and for almshouses.

It is a mistake, I think, to make by-laws which are counsels of perfection. Very few officers of the mercantile marine have cabins as big as 10×8 ft. to themselves before they get their Masters' certificates: and they do not by any means always get so much accommodation then. Very

frequently, too, the one port-hole is no bigger than a soup-plate. It is a small cottage bedroom that would not be reckoned a spacious state room on a liner; and if it is answered that on board ship people can get fresh air and plenty of it, I reply that that is equally true in the country.

It is a mistake, too, to limit the choice of materials for building. A very large proportion of the inhabitants of Northern America and Northern Europe live comfortably in wooden houses; but wood as a material for human habitations is not recognised by the majority of those who govern us.

In my judgment anyone who will build cottages may wisely be given a pretty free hand as to design and construction if the rooms are sufficiently lofty and the windows adequate, provided he is kept up to the mark thereafter by capable and independent inspection in such matters as structural repairs, water supply, pig styes, and sanitary conveniences.

The chain of responsibility in this regard seems fairly complete at present with a Sanitary inspector and a Medical officer of health for every district and a County medical officer besides, not to mention the Local Government Board over all; but I fear it is rather a paper completeness, for we have the damning facts that a Government Inspector recently reported of two districts in this county that some five per cent. of the dwellings were unfit for habitation, while nearly as many more were almost as insanitary; that in fourteen parishes of an adjoining district two cottages out of three were bad; and that fifty-nine Cornish incumbents declared, in answer to an inquiry about housing conditions, that their local authorities had not taken the action they ought in regard to insanitary and undesirable premises.

I know nothing about the Cornish parishes, and I cannot speak with first-hand knowledge about those in Devonshire. But while I think it probable enough that most of the cottages condemned here were already on the black list of the local officials, I also think it very likely they would have remained there quietly without anything more being heard of them, but for the reports of Dr. Carnwath.

Nor is the reason of this far to seek: a Sanitary inspector, though partly paid by the County council, is liable to dismissal by his local council, a body which he is probably serving also as road surveyor or relieving officer: his sanitary salary is not, as a rule, the most important part of his emolument, and Talleyrand's golden rule, "Surtout point de zèle," is of far-reaching application.

The Medical officers of health in like manner are seldom whole-time men. Some of them are conspicuous for fearless exposure of abuses, and I should be sorry to say that any of them fail of their duty. But in the

majority of cases the Medical officer of health has a good deal to do besides his sanitary inspections; that branch of his work unfortunately does not command much public sympathy, and reformers therein nearly always find themselves in advance of public opinion.

And though the support of the county Medical officer of health makes it easier to deal with the passive resistance of indifferent local bodies, yet the system has the same weak point as the British Constitution, which takes for granted that any ephemeral majority of electors or representatives, or even a majority of representatives returned by a minority of electors, has also a majority, if not a monopoly, for all time of the wisdom of the community to which it belongs.

This is a theme which opens up wide subjects, too wide and possibly too controversial for such an occasion as this, so I will say no more than that if you want to make sanitary progress in rural districts, you must devise some support for reformers that will take the place of "average public opinion," for, between vested interests and indifference, average public opinion is generally very well content to leave things alone.

Just now, however, I think that average public opinion in regard to rural housing has arrived at the conclusion that something should be done: a conclusion which a cynic once declared was the usual prelude to doing something foolish.

I trust that will not be so in this case, and I think it need not be, if certain sound principles are borne in mind. Those principles I would define as follows:

1. The ultimate object is that cottages should be let at economic rents, *i.e.*, at rents which will give a fair return on expenditure in addition to providing for necessary repairs and outgoings.

2. That labourers' wages should be sufficient to enable them to pay such rents.

3. That no housing legislation will be satisfactory that tends to perpetuate the existing system under which a large percentage of the rural labourers' wages are paid in the shape of low rents or allowance.

4. That it is no part of the business of the taxpayers or the ratepayers or of those that represent them to provide farm or factory equipment for landowners or manufacturers, big or small, from public funds. If the small owner cannot furnish his farm (or works) with adequate accommodation for the labourers required to do it justice, he had better sell his property to somebody who possesses the necessary capital.

5. That on the other hand the community may properly help to house those who, because they exist for the service of all, are "nobody's children," *e.g.*, policemen, roadmen and village tradesmen, also old age pensioners and

widows. The problem is not an easy one, and the future of English agriculture will be much affected by the way in which it is handled.

We are told every day that much more might be got out of the land; some professor has estimated, I think, that there are over a million acres of moorland and waste, now let on an average for 2s. 6d. an acre, which, by afforestation and reclamation might be made productive. Afforestation on a large scale means building on a large scale, and that under difficult and expensive conditions; as to reclamation of moorland, I have seen something of it, and I know it is quite possible to convert 2s. 6d. land into land worth 7s. 6d. per acre or more. The only trouble is that to give a fair return on the outlay involved, the increased rent should be 12s. 6d. instead of 7s. 6d.; a rent which reclaimed moorland waste will not generally command unless and until the prices obtainable for the food stuffs or meat producible on it are far higher than at present.

I might get on dangerous ground, especially as I happen to be a free trader, if I said anything of the connection between cheap food and the health and physique of the nation, so I will content myself with the safe but unheroic assertion that I think it is capable of mathematical proof that low prices for food stuffs make it economically unprofitable to expend much labour on poor land, for the simple reason that the value of the crop will not repay the cost of growing it.

Be that as it may, the development by intensive culture of the resources of land which is not waste, a point in which they are much ahead of us abroad, is largely a matter of labour; which again resolves into the question of accommodation for that labour and the price at which the accommodation can be provided: and if it is going as at present to cost £8 or £10 a year of somebody's money (in interest and upkeep) to house every married man who works on the land, and if food prices remain at their present moderate level, the prospect of giving profitable employment in agriculture to additional millions of population is remote.

You will have noticed my first "if"—the cost of cottages—goes to the root of the problem. As yet the cheap cottage on which little is spent to begin with, and less afterwards, is likewise a nasty one, and there is nothing so expensive in the long run whether to the occupiers or to the community as unhealthy dwellings.

But need the cheap cottage be a nasty one always?

If the combined wisdom of scientific men and sanitary experts can devise new materials and new methods for building cottages that will be both healthy and cheap, they will add one more to the many obligations already owed to them by the public.

CONGRESS AT EXETER.

LECTURE TO THE CONGRESS.

By SIR WILLIAM J. COLLINS, D.L., J.P., F.R.C.S., M.S., B.Sc., M.D., D.P.H.

(VICE-PRESIDENT OF THE INSTITUTE.)

THE CHADWICK SCHOOL OF THOUGHT.

(An Appeal from the New Sanitarians to the Old.)

I HAVE come to the conclusion that The Royal Sanitary Institute must be either a very forgetful or a very forgiving organisation. In the year 1902, at their behest, I delivered at their Congress at Manchester what I should not myself have presumed to call the "*popular* lecture" of the Congress on "The Man *v.* the Microbe." In 1906, at Bristol, I was again made responsible by the authorities for a presidential address in the section dealing with sanitary science and preventive medicine. On both these occasions I was told that I had deviated somewhat widely from the smug complacency of conventional orthodoxy, and accordingly solaced myself with the reflection that I should in consequence never again be called upon to address The Royal Sanitary Institute. It was therefore with surprise, mingled with the other sentiments indicated, that I received a courteous invitation from your Council to deliver at Exeter, this year, what is called the "Lecture to the Congress."

A little retrospective meditation sufficed to suggest to me the subject of the address. I had with my father (an original member of the Institute) attended its early meetings, when it was in what might be called its larval stage. I well remember the sanitarians of those days, Chadwick and Richardson, William Farr, Alfred Carpenter, to name but a few of the early fathers of the Institute, whose strong personalities and robust hygienic zeal deeply impressed their contemporaries, and who, departing, have left behind them footprints on the sands of time, which may well serve to hearten the present generation to greater achievement and yet

further pursuit. I recall the long *pupa* stage of the Institute in the dowdy restriction of Margaret Street, and I rejoice in the further metamorphosis and Royal vesture which recent years have witnessed in the fair *imago* that now suns itself in the Buckingham Palace Road.

Times have changed, the Institute has changed, the men have changed, new lines of research have been opened up, brand new sciences have been born, old truths are seen in new lights, venerable dogmas are accounted old wives' tales, or flippantly disregarded as back numbers. Amid this welter of innovation the public are bewildered, legislators perplexed, and the fair form of Science is aspersed as being as liable to fluctuation as are the fickle fashions of the day.

It is well at these annual gatherings to do a little stock-taking, to review the situation in regard to the subject matter with which our organisation is engaged, to verify our bearings, to keep our minds indeed ever open to receive new truth, to be ever ready to reject the false, the obsolete and the effete, but at the same time not to assume that the latest thing in science, or in anything else, is necessarily the last or the best, nor lightly to reject the earnest testimony of far-seeing, disinterested, and thoughtful men, even though of an earlier epoch than our own. Edmund Burke, amid the crash of the French Revolution and its pale reflection here, in search of purity of political doctrine, endeavoured to temper the turbulence of his day by "an appeal from the new Whigs to the old." "None of us are infallible, not even the youngest of us," and it is a duty we owe to the sanitary giants of the past generation to reconsider, in the light of evidence since accumulated, the truth or falsity of the doctrines that they preached.

In the last year or so, as chairman of the Chadwick Trust, I have made it my duty to read again many of the reports, lectures, and essays which flowed from the facile pen of Edwin Chadwick, and to regard them in the light of twentieth century sanitary science. I rose from their reperusal more than ever impressed with their sanity of judgment, their large and liberal outlook, their insight and foresight, as well as with the breadth of view of the philosophy and the humanity with which they are instinct.

I am inclined to think that, apart from minor questions which were of more or less ephemeral interest, Chadwick's teaching still has its message for us to-day. Some, at any rate, of our modern sanitarians seem to lack the very qualities in which Chadwick was pre-eminent. They have not the massive grasp, the many-sided method of approach, the hold on totality which he had so conspicuously. The tendency to over-specialise, to carry

on research in water-tight compartments, to hunt the little game, to limit environment to the laboratory instead of ranging free o'er all the field of man, to over-accentuate the microscopic or even the ultra-microscopic, to some extent have seemed to debilitate and deform the handiwork of latter-day hygienists. I am led by these considerations to invite your attention for a while to that school of thought in sanitary reform for which Chadwick stood, to compare (and in certain instances to contrast) it with the teaching and tendencies of to-day, and, in short, to appeal, not in the spirit of reaction blindly worshipping "the wisdom of our ancestors," but in that of a reverent homage to a great man, from the new sanitarians to the old, in search of the best and surest foundations upon which to base sanitary progress and hygienic reforms.

What, then, of Chadwick? his life, his work, his inspiration, his influence, and his lesson for us.

It was well that, before his life of ninety years closed, a life that almost spanned the nineteenth century (for he and it were in their teens together), a sympathetic biographer was found to prepare, under his hero's eye, a record of his beneficent activities. In 1887 my old friend and colleague, Sir Benjamin Ward Richardson, published in two volumes "The Health of Nations: a Review of the Work of Edwin Chadwick, with a Biographical Dissertation." The title is reminiscent of that other work, its predecessor by more than a century, so often talked of and so little read, the "Wealth of Nations," by Adam Smith. Each work is significant of the century to which it belongs. The economics of health came upon the scene later than the economics of wealth, and it is largely the task and destiny of the twentieth century legislator and administrator to harmonise the competing claims of health on the one hand and wealth upon the other.

Even Richardson, who had much in common alike in heart and head, in ideal and outlook, with the father of English sanitation, found Chadwick's personality and influence not easy to describe, and defiant of any ordinary classification; "he treated all professions with equal freedom, when any subject connected with his own pursuits was under discussion, so that they who listened often wondered, when they were not intimate with him, what his own profession might be." The historian, says Richardson, "will feel no doubt that in this man some peculiar interest was embodied; that the man did some work or works which exerted a striking influence over his time, and caused great changes in its social system; and yet there will be a haze about him which will be scarcely penetrable. The man did and did not. He made laws? Yes. Was he then a legislator? No, not even a member out of office in the lower House. He

did something for sanitary improvements? Yes. Was he then a doctor? No; on the contrary, he looked on them as necessary evils, and as not very likely to last."

He would indeed have been staggered had he lived to see the day when a State medical service was almost upon the cards, while his view that "doctors were not very likely to last" was presumably based upon a too roseate anticipation of the advent of an epoch when, thanks to the realisation of sanitary ideals, the national healthiness would be such that doctors would be unable to live, yet perhaps unable to die. Richardson in despair admits that "he fails in power to describe the reason of Chadwick's power; it is a thing to be accepted like an ultimate fact." "He was a radical reformer *minus* every apparent trace of the radical tendency; statesmen who wished to be guided felt him a safe counsellor." Like Cavour his political art concealed his art. He was nevertheless sometimes led by men inferior to himself; his opponents urged that at the best "he did no more than think the same thoughts that other men think, and that in fact he was not original." May we not gather from all this that Chadwick belonged to that type which has baffled the conception of the littleminded and the conventional, and which has ever been the despair of the specialist and the orthodox; the type which nevertheless rules the world; the type of the practical mystic. And, if it be true that he did but think the thoughts of other men, had he not that rare facility and felicity which we call genius, whereby he was able to say, what everybody wanted to say, better than anybody?

Chadwick owed much to his Lancashire forebears: his grandfather had been the friend of John Wesley, and "the new philanthropy" which sprang from the methodist revival shed its influence around his early years. From his father, the tutor of John Dalton, he derived a love of natural history and philosophy, and after the early death of his mother he moved to London with his father, when the latter became editor of the "Statesman," the leading liberal paper of that time. Though he entered for the Bar and was called in 1830, journalism claimed his first attention. In the "Westminster Review" of 1828 appeared his article on life assurance, which attracted the attention of Grote and the Mills, father and son. In it we find him thus early asserting the potency of environment on health and mortality, and we may trace the origin of his "sanitary idea," of which more anon. The following year, articles appeared from his pen in the "London Review," on "Preventive Police" and "Public Charities in France." These won the esteem of Bentham, then in his eighty-second year, and Chadwick was ushered into the *côterie* of which the great

utilitarian philosopher was the central figure. Bentham's personality and doctrine made a deep impression on his contemporaries; his principles remained operative for more than one generation after his death, and traces of them may be detected still. His long life, 1748 to 1832, stretched over an era of transcendant interest in the history of the nations of Europe and America; he was the first to coin the word "international." In earlier years he was on friendly terms with the Wesleys, Adam Smith, Pitt, and Mirabeau; in middle life the elder Mills and Romilly were his intimates, while his closing years drew around him as devoted disciples Edwin Chadwick and his co-worker Southwood Smith. The latter, of whom I shall have more to say, performed the quaint last rite for Bentham, as directed by the Master, and on June 9th, 1832, at the West Street School of Anatomy, amid an awful thunderstorm, delivered a funereal *éloge* over the dissected corpse of the departed philosopher. Chadwick, less acquiescent, declined Bentham's offer of an assured income if he would undertake the rôle of expounder of the utilitarian philosophy. He, nevertheless, lived with Bentham during the last few years of his life in a secretarial capacity, and aided him in the production of his administrative code.

Though he thus declined to be the propagandist of utilitarianism, Chadwick had imbibed from the octogenarian philosopher a breadth of view and basic notions of a juridical system which powerfully fomented within him the forces of his developing personality. He had become possessed with what has been called "his sanitary idea"; he studied typhus fever in the rookeries of East London, and nearly fell a victim to it. In 1832, a year ever memorable in the annals of political reform, in a reign which "gave rise to no law of direct sanitary intention," Mr. Chadwick was most fortunately appointed Assistant Commissioner to an Enquiry into the working of the Poor Laws, which had been in operation, practically unaltered, from the spacious times of Queen Elizabeth (1601). From the vantage ground of this relatively subordinate position, under Bishop Blomfield's Commission, Chadwick started on what was to be his life's work. Duty and faculty were united in this enterprise. He saw with his eyes and not with his ears; investigations made on the spot, statistics, all sources of information, were pressed into the service, and his reports became models of what sanitary surveys ought to be. Inquiry into factory life (1833), secretaryship to the newly-created Poor Law Board (1834), investigation into the sanitary condition of the metropolis (1838), in rapid succession engaged the activities of Chadwick. The state of things at the beginning of the Victorian era is happily sketched by Sir John Simon

writing in 1890, when he said: "The modern demand for sanitary reform, the demand that the better knowledge which had been gained as to the preventability of certain diseases should be represented in corresponding laws and activities for the protection of the public health, may be said to have begun in this country in 1838; and the successes which it had gained within the space of ten years from its beginning were of so very important a character, that the story of that decennium claims to be told in detail. Superficially, much of it will be a record of the doings of Government Departments, Parliamentary Committees, and Royal Commissions, but even on the surface, and still more in the deeper strata when they are known, the story of the ten years is above all an account of the zealous labours of one eminent public servant, Sir Edwin Chadwick."

This truly just and equally generous encomium from the masterful pen of Sir John Simon is the more noteworthy, since his point of view on sanitary principles and policy was, as I shall have occasion to show, radically different from that of Chadwick and his coadjutors. It was after the overthrow in Parliament, in 1854, of the old Board of Health that Simon became medical officer to the new Board set up in 1855; and in this office, and during his subsequent service with the Privy Council and the Local Government Board, a policy in sanitary matters was developed which differed not a little from that which had inspired the Chadwick School.

Before proceeding further, it will be well to inquire who were the pioneers in sanitary reform whom we may properly group under the collective designation of the Chadwick School of Thought. What sort of men were they? What was their intellectual kinship, what the *affiinité de cœur* which knit them together? What faith inspired them? With what philosophy were they imbued? What was the *esprit de corps* which gave momentum to their teaching, what the *esprit des lois* which they sought to embody in legislation and effectuate in administration?

To answer these interrogatories is not an easy task. Doubtless there were many illustrious obscure whose names are not recorded, but who did similar work and were sustained by similar high ideals to those whom I am about to name. Something was due to the *Zeist Geist* (the spirit of the times), for not only here but on the Continent, the nineteenth century, even before its jubilee had sounded, had witnessed an outburst of sanitary reform which was awakening or rather re-awakening a gospel of cleanliness, long overlaid or obscured by superstition, formalism, or self-satisfied ignorance.

According to Simon the chief medical associate of Chadwick was Dr.

Southwood Smith, and "all which is distinctively medical in the reports of the General Board of Health from 1848 to 1854 may no doubt be regarded as Dr. Smith's teaching."* He was a man after Chadwick's own heart, another of the unclassifiable type. Born in 1788, at first a Unitarian minister, teaching a Universalist doctrine in Edinburgh, later M.D. of that University. From 1824 to 1839 Physician to the London Fever Hospital, he came to speak with authority on zymotic disease. He wrote and spoke with equal felicity and charm on "The Divine Government" and the "Philosophy of Health." He was an excellent anatomist. I have already referred to his services to Bentham before and after the latter's demise, and he, like Chadwick, throughout their lives bore indisputable evidence of having been with Bentham. Lord Brougham, and Grote, and Mill were also among his intimates. He was respected alike as a "man of thought and benevolence," and "from 1830 onwards he became more and more identified with the cause of sanitary reform, and has to be gratefully remembered as one of the worthiest and most zealous of its early promoters." *

Next to be named as pre-eminent among the Chadwick School is Dr. William Farr, born in 1807 and died in 1883. It is not without interest to note that the combined ages of Farr, Southwood Smith, and Chadwick spanned nearly two centuries and a half. By those who knew him he was described as "a man of liveliest intelligence, and with a mind which revelled in generalisation, well instructed in theoretical medicine according to the earlier lights of the nineteenth century, and a master of methods by which arithmetic is made argumentative; he had also considerable literary resources and powers." He recognised, nevertheless, the limitations of the statistical method, and Sir Thomas Barclay, who knew him well, assured me that he never tired of praising Descartes' *Discours sur la Méthode*, as pointing the way for the truth-seeker.

Farr had already in the 'thirties of last century prepared a course of lectures on hygiology, but could get no one to be interested in the subject: his appeal fell on deaf ears. In 1837 he contributed to McCulloch's great work on the British Empire an article of some eighty-five pages on vital statistics, which laid the foundations of that science. The next year witnessed the inauguration of civil registration of births and deaths, and, thanks to Chadwick's recognition of Farr's qualifications, the latter was appointed compiler of statistics to the Registrar-General. This office he held for forty years, annually penning reports of the utmost value on public health questions. The reversion to the office of Registrar-General

* Simon, "English Sanitary Institutions," pp. 186–7.

was justly his, but political patronage decided otherwise, and Farr resigned in 1879. He is described as a man of large and liberal views, a glutton for work, of great personal charm and genial disposition, and his statistical researches enjoyed a world-wide celebrity.

Two other co-workers with Chadwick in those early days must be named in this connection, Dr. Neil Arnott and Dr. Kay, both medical men of great erudition and manifold acquirements, both instinct with philanthropic zeal and firmly convinced of the intimate relationship between physical agencies and moral betterment and worsement. These two men, also, of unbounded energy, both exemplified in their long and active lives the validity of their own sanitary doctrines. Arnott, born in 1788, lived to 1874; he had been a great traveller, was an accomplished linguist, a talented inventor (notably of stoves), but on moral grounds declined to patent his discoveries; he was an original senator of London University, and in 1861 wrote, in philanthropic vein, a *Survey of Human Progress.* Dr. Kay, born at Rochdale in 1804, died in 1877, having on his marriage added the name of Shuttleworth to his own. He will ever be remembered for his services when, as secretary to the Privy Council Committee, he developed the system of national education. In earlier years he studied the epidemicity of typhus and cholera, and wrote on the moral and physical condition of the working classes. His enlightened policy won the warm approval of Matthew Arnold, who was no lavish dispenser of indiscriminate praise.

Another powerful personality of true nobility, not indeed a medical man, but a mighty social reformer ever to be held in reverence and esteem, was linked with Chadwick and Southwood Smith, and less closely with the others I have named in the work of the old Board of Health from 1848 to 1855, the seventh Earl of Shaftesbury. That lofty embodiment of *noblesse oblige* successively and successfully laboured to improve our asylums, our factories, our slum-lands, our ragged schools, and our lodging houses. He worked as ever in the Great Taskmaster's eye, and he has been truly described as "the impersonation of the philanthropic spirit of the nineteenth century."

Yet another contemporary and co-worker in these early Victorian days stands out pre-eminently as a sanitary reformer of the Chadwick type: one whose heroic ministrations initiated military hygiene, and brought to the succour of the sick and wounded an informed gentleness and a humane efficiency which have placed the name of Florence Nightingale second to none among the venerated of her sex.

These pioneers in sanitary reform, who were more or less intimate

with Chadwick or his fellow-workers, had foreign contemporaries, like Semmelweiss, who preached a similar gospel of cleanliness on the continent of Europe, and had also their forerunners, like John Howard (1726-1790), vegetarian and teetotaller, chiefly known as the reformer of prisons at home and abroad, but in truth the author of inspection and report, as applied to social problems. Charles Lamb and Carlyle sneered at his labours as "the innocent cause of the benevolent platform fever," but Romilly recognised the beneficence of his wondrous winter's journey, and exclaimed: "What a singular journey! Not to admire the wonders of art and nature, not to visit courts and ape their manners, but to dive into dungeons to compare the misery of men in different climates, to study the art of mitigating the torments of mankind. What a contrast between the painful labour of this man and the ostentatious sensibility which turns aside from scenes of misery, and with the mockery of a few barren tears, leaves it to seek the comfort of its own distress."

Haygarth, of Chester (1740–1827), again was a man in advance of his times in sanitary organisation for the prevention of infectious fevers, while the labours of Percival, the Unitarian doctor of Manchester (1740–1804), the friend of Hume and Robert Owen, must not be forgotten in dealing with social betterment of the industrial classes as the secret of sanitary progress.

I must not, however, unduly extend my range, for in truth it would be a not difficult and a most attractive theme to trace the evolution of the sanitary idea back away to Moses, and to show that in every age, and almost in every clime, there have been these prophets, or seers, or medicine men, or large-hearted and broad-minded philanthropists, bent on applying the results of observation and experience, and teaching mankind the virtue of cleanly living.

One other name, however, I must add, last but not least, as strictly appertaining to the Chadwick circle, that of his life-long friend and genial biographer, Benjamin Ward Richardson. Of his personality and life's work I am privileged to speak on another occasion, and I, therefore, merely name him here and recall the years of colleagueship with him, which are a precious memory, and acknowledge the help received from his writings in putting together the characteristic point of view of what may be called the Chadwick cult.

Let us, then, proceed to inquire what were the doctrines of disease and its prevention, what the objectives held in view, what the ideals of these mid-nineteenth century sanitary enthusiasts that urged to action. What, in fact, was Chadwick's sanitary idea?

It was, according to Richardson, "that man could, by getting at first principles, and by aiming at causes which affect health, mould life altogether into its natural cast, and beat what had hitherto been accepted as fate by getting behind fate itself, and suppressing the forces which led up to it at their prime source." To this end, direct investigation on the spot into the removal of the preventable antecedents of disease and crime claimed his attention: "reliance on fact as a basis of comment." The so-called "practical man" in politics was his aversion: he "knew of no investigation," he said, in his perversely paradoxical way, "which did not reverse almost every main principle and assumed fact on which parliamentary committees and politicians of high position were prepared to base legislation." He dwelt on unity of purpose in the prevention of evil. He was large, imperial if you will, in scope, but in method democratic, though his critics regarded him as inclined to autocracy. While he did not "despise the single fact" he resorted readily to statistics, initiated our registration system, and, utilising its results, often illustrated an argument and clinched a point by recourse to the language of figures. He demonstrated the improved value of life as shown by the increased mean expectation of its duration in the eighteenth century compared with the thirteenth, in obedience to social and sanitary reform. He set about reforming the dwellings of the poor and the malhygiene of our prisons; he encountered the opposition of some, of whom he said "their hearts were larger than their heads." He was, however, in the best sense a humanitarian. On the first School Board he opposed corporal punishment. He was struck by the influence of school life in disseminating disease: he said, "in some school conditions a mother sending her child to such is sending it into a preparation for a fever, or into measles mixtures, or into small or chicken pox, or some form of disease. Children thus infected in schools frequently bring the infection into crowded and ill-ventilated homes, where several sleep in the same bed." Compulsory attendance under such conditions brings compulsory deterioration. He advocated baths in schools and personal cleanliness as preventive of infectious and contagious diseases. He started the "half-time" scholar system, and anticipated medical inspection of schools, from which he hoped for beneficial results. He estimated "the physiological limits of mental labour." "Bright voluntary attention was the attitude of the scholar to be desired, the time for which this could be sustained grew," he said, "with the child's growth, and could be increased by sanitary surroundings as well as by the interest that could be imparted by a competent teacher." Physical training and sanitary surroundings would, he urged, "banish"

epidemic and eruptive diseases. He favoured drill in school, but opposed any direct or indirect methods of conscription. He urged moral instruction in schools. He was a warm advocate of competitive examinations for entrance to the public services. He deplored the domination of our great administrative departments by "changing party political chiefs, who come entirely unprepared to deal with the subject matter of their departments" (of which he could give amusing yet sad instances), whereby the permanent officers, "instead of working up to superior knowledge, work down to distracted attention, to apathy and antipathy," harassed by any troublesome new work, until they learn, as Dickens says, "how not to do it."

Chadwick's monumental "Survey into the Sanitary Condition of the Labouring Classes of Great Britain" was the final blow to the "letting-things-alone" party in high places, and led to the institution of local medical officers of health. When he and his colleagues visited the fever-stricken homes of the poorest in our large cities, he said "it was frequently declared by the inmates that they had never for many years witnessed the approach or presence of persons of that condition near them." "The duty of visiting loathsome abodes, amidst close atmospheres compounded of smoke and offensive odours, and everything revolting to the senses, is a duty," he said, "which can only be expected to be regularly performed under much stronger motives than can commonly be imposed on honorary officers . . . . . The descriptions given by Howard of the worst prisons he visited in England (which, he states, were the worst he had seen in Europe) were exceeded in every wynd in Edinburgh and Glasgow inspected by Dr. Arnott and myself in company with the municipal officers of those cities. More filth, worse physical suffering and moral disorder than Howard describes as affecting the prisoners, are to be found amongst the cellar population of the working people of Liverpool, Manchester or Leeds, and in large portions of the metropolis." Deaths from fever and smallpox were, he found, almost exclusively confined to the worst parts of the towns. In an epidemic of the latter in Bath in 1837, which carried off over three hundred persons, scarcely a single gentleman and only two or three tradesmen were among the victims. He claimed that by knowing the general lie of a town and the conditions of its poorer dwelling houses, he could postulate the habitat and haunts of infectious diseases. He believed in the common origin of zymotics in sanitary neglect—"that smallpox follows on much the same lines as typhus, so does scarlatina, but with wider deviations as to classes of cases and conditions of persons." Sutherland and Galton,

*

he added, had shown that in Malta, plague, cholera, smallpox, and anthrax had in different years been localized in the same squalid quarters. The propagation of typhus he traced largely to untrapped drains, and the use of efficient traps and glazed earthenware pipes were early advocated by Chadwick. He had been brought up in the belief that epidemics were largely "climatorial" in causation, but he emphasised the fact that as in the case of smallpox they were "largely communicable by infection." He urged the prompt isolation of infected persons in a well-ventilated chamber, so as to "let a current of air pass through the room and over the patient; to observe all the details of regulations as to cleanliness of the patient and the articles of clothing and furniture, and the removal of excreta." He enunciated precise rules for the sanitary construction of dwellings and hospitals, laying special stress on ample cubic space to get rid of "vitiated, phthisis-producing air, and (if the crowding is intense) fever-producing air." Personal cleanliness as a prophylactic against infectious disease was also accentuated. He said, "if a great epidemic were to occur again, I would proclaim and enforce the active application of soap and water as a preventive. I have had frequent opportunities of observing this plan as a factor of sanitation," and he proceeded to cite examples.

After a careful examination of the enormous amount of evidence which he had collected, Chadwick thus summed up the conclusion of the whole matter:—

> "That the various forms of epidemic, endemic, and other disease are caused or aggravated, or propagated, chiefly amongst the labouring classes by atmospheric impurities produced by decomposing animal and vegetable substances, by damp and filth, and close and overcrowded dwellings. . . . That such disease, whenever its attacks are frequent, is always found in connection with the physical circumstances above specified, and that when these circumstances are removed by drainage, proper cleansing, better ventilation, and other means of diminishing atmospheric impurity, the frequency and intensity of such disease are abated, and where the removal of the noxious agencies appears to be complete, such disease almost entirely disappears. That cases of smallpox, of typhus, and of others of the ordinary epidemics occur in the greatest proportion in common conditions of foul air, from stagnant putrefaction, from bad house drainage, from sewers of deposit, from excrement-sodden sites, from filthy street surfaces, from impure water, and from overcrowding in private houses and in public institutions. That the entire removal of such conditions by complete sanitation and by improved dwellings is the effectual preventive of diseases of these species, and of ordinary, as well as of extraordinary, epidemic visitations. That when such diseases continue to occur their spread is best prevented by the separation of the unaffected from the affected, by home treatment if possible, if not, by providing small temporary accommodation;

iu either case obviating the necessity of removing the sick to a distance, and the danger of aggregating epidemic cases in large hospitals, a proceeding liable to augment the death-rates during epidemics."

Chadwick saw the urgent need of a radical reform in our local government system before any real advance on the lines he desiderated could be made. He urged the unification of local government services, especially in the metropolis, and he laid it down as a "sanitary axiom, that the duty of carrying fouled water *out* of houses and *out* of towns, clear of the sites, constantly through self-cleansing channels, should, with the duty of carrying water *into* houses, devolve upon one and the same authority, and that such authority should be a competent and responsible public one."

Students of politics and administration in the last quarter of a century will be able to judge how far Chadwick's dreams have been realised in regard to the municipal machinery through which our public health operations are effected.

The reciprocal influence of morals and sanitation was a favourite doctrine of our early hygienists, and they readily supported Mr. J. S. Buckingham in his campaign against intemperance. Chadwick maintained "that the removal of noxious physical circumstances, and the promotion of civic, household, and personal cleanliness, is necessary to the improvement of the moral condition of the population; since sound morality and refinement in manners and health are not long found co-existent with filthy habits amongst any class of the community."

The goal to be attained and the means by which it might be reached were thus portrayed by this school of thought. They said "when a man shall be brought to acknowledge (as truth must finally constrain him to acknowledge) that it is by his own hand, through his neglect of a few obvious rules, that the seeds of disease are most lavishly sown within his frame, and diffused over communities; when he shall have required of medical science to occupy itself rather with the prevention of maladies than with their cure; when governments shall be induced to consider the preservation of a nation's health an object as important as the promotion of its commerce or the maintenance of its conquests, we may hope to see the approach of those times when, after a life spent almost without sickness, we shall close the term of our unharassed existence by a peaceful euthanasia."

I need not deal at the same length with the teaching of those whom I have indicated as preaching the same sanitary *credo* as I have with the writings of Chadwick, but I will cull a few extracts to illustrate my thesis.

Dr. Southwood Smith, writing on "epidemics considered with relation to their common nature and to climate and civilisation," observed:—

> "Overcrowding, for example, we can prevent; the accumulation of filth in towns and houses we can prevent; the supply of light, air, and water, together with the several other appliances included in the all-comprehensive word cleanliness, we can secure. To the extent to which it is in our power to do this, it is in our power to prevent epidemics. The human family have now lived together in communities more than six thousand years, yet they have not learnt how to make their habitations clean. At last we are beginning to learn the lesson. When we shall have mastered it we shall have conquered epidemics."

Dr. Neil Arnott and Dr. Kay (afterwards Sir J. P. Kay-Shuttleworth), writing "on the prevalence of certain physical causes of fever in the metropolis which might be prevented by proper sanitary measures," told the same tale of the squalor, the fœtid courts, unscavenged streets, undrained dwellings in which the London poor lived and died, a condition of "one universal atmosphere of filth and stink," which they held responsible for the "generation" of fever. Not only, as Dr. Guy observed, was such filth the "*nurse* rather than the *parent* of fever," but, he added as his final conclusion, "in extreme cases fever may be bred of filth." Such view was rebuked as heretical by the specifically-minded Sir Thomas Watson, who nevertheless conceded great importance to the predisposing factors of disease arising from malhygiene.

Shaftesbury, at public meetings, often aided and supported by Prince Albert, and also in the House of Lords, lent his powerful advocacy to the need of housing reform. In first inducing the legislature to concern itself with the housing of the poor, he argued that fevers and smallpox were "chiefly confined to the lowest classes of the population, and he believed that by improved lodging-houses the disease might be almost exterminated."

Miss Nightingale always insisted upon what she termed "the practical unity of epidemics," the futility of attacking one zymotic by itself without removing "the causes of epidemic susceptibility generally." In her trenchant "Notes on Nursing," she says:—

> "I was brought up, both by scientific men and ignorant women, distinctly to believe that smallpox, for instance, was a thing of which there was once a first specimen in the world, which went on propagating itself in a perpetual chain of descent, just as much as there was a first dog (or first pair of dogs), and smallpox would not begin itself any more than a new dog would begin without there being a parent dog. . . . . . Since then, I have seen with my eyes, and smelt with my nose, smallpox grow up in first specimens, either in close rooms or overcrowded wards, where it could not by any possibility have been caught, but must have begun. . . . . . I have

seen, for instance, with a little overcrowding, continued fever grow up, and with a little more typhoid fever and with a little more typhus, and all in the same ward or hut. Would it not be far better, truer, and more practical if we looked on disease in this light?"

She did not under-rate infection, though she bravely said, "a true nurse knows nothing of infection, except to prevent it," and urged surrounding the infected patient with "ample ramparts of fresh air." Such teaching was, of course, accounted rank heresy by the laboratory exponents of the immutability of species of specific diseases, a doctrine which they held with a tenacity worthy of a Mosaic cosmogonist. Not only did her immense practical experience in the Crimean War clothe her words with authority, but Dr. William Farr, from the Registrar-General's office, was enunciating similar views from a study of the Bills of Mortality. In his able article, in McCulloch's "British Empire," in 1854, he gave a masterly survey of the health and sickness of this country since Saxon times, dealing with epidemic diseases and their causation. He ridiculed the excessive store set by foreign nations on quarantine laws. He said:

"Governments might shut out the four winds of heaven, but pestilence will laugh at their precautions while they retain the elements of pestilence in the bosom of their populations. Every fact with which science is acquainted tends to prove that if we cannot exclude this subtle fire from our habitations, we can to a certain extent render them pestilence-proof. A prosperous nation, whether scattered over a cultivated soil, or concentrated in well-constructed cities, has little to dread from the importation of cholera, plague, or yellow fever. In unhealthy places, the exclusion of one form of disease is of little advantage; for other priests minister at the altars instead, and sacrifice the victims. . . . . . It has been shown that external agents have as great an influence on the frequency of sickness as on its fatality; the obvious corollary is that man has as much power to prevent as to cure disease. . . . . . It will be the duty of the Government, the municipal corporations, and all classes of citizens, to render the towns of this country and every establishment where large numbers are collected together, perfectly adapted to the wants of the human organisation, and compatible with the full enjoyment of health."

In his letter to the Registrar-General in 1867 he contested the teaching of Malthus as to epidemics being the restraining influence on population, whose increase would otherwise press on the means of subsistence. He repeated that "it is by no means proved that the general mortality under unfavourable sanitary conditions is much reduced by rendering a child insusceptible of one type, while he remains exposed to all the other types of zymotic disease," and he quoted Dr. Watt's researches in Glasgow in support of this contention. He discussed the

pathology of zymosis and its relation to combustion and fermentation, and drew attention to the microscopic organisms then being associated with certain infectious diseases. He summed up his sanitary creed thus:—

> "The primary object to aim at is placing a healthy stock of men in conditions of air, warmth, food, dwelling, and work most favourable to their development. The vigour of their own lives is the best security men have against the invasion of their organisation by low corpuscular forms of life; for such the propagating matters of zymotic diseases may be held to be. Vaccinate by all means, but at the same time provide streets, spaces, dwellings, water, drainage. Do not leave the dirt in rookeries, in pits, in dunghills. What are municipal bodies, town councillors, aldermen, mayors, provosts good for if they cannot by administrative measures displace rookeries by healthy habitations, supply the people with water and with the means of 'cleanliness,' which stands, proverbially, next to 'godliness'? And again, healthy sanitary conditions as to food, drink, and cleanliness of person, house, and city stand first in importance; after it, but subordinately, come quarantine, vaccination, and other preventives as means of subduing mortality."

Sir Benjamin Ward Richardson expressed himself as unable to accept, at any rate in its entirety, the germ theory of disease as promulgated by Pasteur and applied by Lister. He admitted its popularity, but claimed that "antiseptic agents were not wanted at all, and that absolute cleanliness was alone sufficient as a remedy, thus marching side by side with advancing sanitation, the mode of cure which stands before all others." He thus echoed Chadwick's shrewd surmise when he said: "Presuming that the advocates of what is called the germ theory of disease could sustain their case, it is believed by many observers that a predisposition or nidus in the affected person must exist before the exciting influence can take effect." Richardson warned his hearers against being led away by what he called "this new conceit; this manufacture of spick-and-span new diseases in our human, bovine, equine, ovine, canine, and perhaps feline species is too much to endure the thought of, especially when we know that purity of life is all-sufficient to remove what exists, without invoking what is not."

No one can study the life-work of Semmelweiss without finding therein a significant example of the elucidation of a great pathological principle leading to a most practical sanitary reform, or without realising that clinical and statistical investigation, thoughtful reflection, and logical application, rather than laboratory methods (too exclusively regarded as research), were responsible for the great revolution in obstetrics and surgery associated with the name of that despised and rejected Hungarian. The late Sir W. J. Sinclair, in his sympathetic biography, relates how

Semmelweiss "was on the path to the introduction into operative gynecology of the measures of prevention against infection, with which we are so familiar, and which we associate with the name of Lister. . . . This was all before 1850, long before the discoveries of the bacteriologists, from Pasteur onwards." Though disparaged by most of his contemporaries and goaded by their persecution into insanity, a few like Haller declared his discovery to be of "immeasurable importance," especially in the surgical wards. Semmelweiss was, in fact, a clinical philosopher, and as such he grasped the truth that between cleanly environment and healthy life there is, as it were, a pre-established harmony. Skoda, indeed, urged him "to occupy his time with experiments on animals" and the "dreary research" of the laboratory; but these methods were distasteful to him. He claimed that "clinical evidence was sufficient to establish the truth of his doctrine," and, adds his biographer, "he was right."

What, then, in fine, were the tenets held in common by this interesting group of nineteenth century sanitarians?

They did not seek the causes of pestilence in visitations of an offended Deity, nor in convulsions of nature; nor did they set much store on epidemic constitutions of the air, or obscure telluric disturbances. They believed that they found in external physical conditions, largely removable and mostly the product of ignorance or neglect, the proximate antecedents of certain infections, called zymotic. These were the nemesis of sanitary shortcomings, the evil fruitage of transgression of hygienic law, and in a sense, therefore, the penalty of moral misdoing. They looked to personal and civic cleanliness, ample supplies of pure air and water and wholesome food, decent dwellings, adequate exercise, reasonable wages and hours of labour, and the prompt removal of all filth and effete material as important factors of national and individual health, and as specially potent against the invasion of pestilence which aforetime walked in darkness, but whose causation was now made manifest by the day-light of science. Further, they believed in the common origin, in filthy conditions, of many so-called specific diseases; they believed in their generation *de novo* by such antecedents, as well as by their propagation through infection. They believed in the mutability of specific diseases, under the influence of favourable or unfavourable soil, holding that the soil must be studied no less than the seed, and that even though certain vegetable or animal particles or ferments stood in some sort of causal relationship to them, the predisposing causes were not less important, and indeed could hardly be overrated. In practical application they sought to influence for good the environment of mankind,

making the battleground with disease *without* rather than *within* the uninfected body, setting great store on the natural vigour of the healthy body itself as the best security against its successful invasion by inimical agencies.

The overthrow of Chadwick and the old Board of Health in 1854, and the loss at the same time of Lord Shaftesbury and Dr. Southwood Smith, coincided with a change of policy in public health questions on the part of the central authority, under the inspiration of Mr. (afterwards Sir John) Simon and the co-workers he collected around him: "a new spirit" was abroad, and imposed itself upon the medical department. They sought to "develop a scientific basis for the progress of sanitary law and administration." They held, according to Simon, that the Chadwick School, "in its perfectly proper zeal against filth, immensely underrated, not to say ignored, the independent importance of morbid *contagia.*" On Simon's advice and responsibility the new medical machinery was got to work. Vaccination inspectors were appointed, and according to Simon some critics alleged that "disproportionate care was bestowed on this one specialty." Drs. Seaton and Ballard entered upon their duties, while laboratory investigations by Dr. (afterwards Sir John) Burdon Sanderson, Dr. Klein, and others were vigorously pursued. The earlier surmises of Kircher, and Leeuwenhoek, and Spallanzani were receiving confirmation from the elaborate researches of Henle, and Pasteur, and Davaine, and Pollender, and a little later of Dr. Koch, while Lister was erecting upon their findings his antiseptic surgery. The *contagium vivum* held the field. Spontaneous generation was damned. The Bacillus appeared to dominate the science of pathology and to dictate the direction of all sanitary reform. The ancients had sought to explain the pestilences of the past by reference to the operations of the Infinitely Great; the moderns, by the ascription of omnipotence to the infinitely little were prepared to account for all communicable diseases, and eradicate them by the application of the appropriate vaccine. Lister, in addressing the British Medical Association at Cambridge in 1880, remarked that twenty years previously bacteria were little more than scientific curiosities, "and the notion that they had anything to do with disease would have been regarded as the wildest of speculations," and he prophesied that "if the British Medical Association should meet at Cambridge again ten years hence (1890), some one may be able to record the discovery of the appropriate vaccine for measles, scarlet fever, and other acute specific diseases in the human subject."

What may be regarded as the orthodox view to-day I will take, at

random, from "Hygiene and Public Health," by Parkes and Kenwood, where it is thus enunciated:—

> "The microbic origin of many communicable diseases may be considered to be established beyond doubt, and this fact is strong presumptive evidence in favour of the remainder, in which no such connection has been traced, being causally dependent on micro-organisms."

And again:—

> "The use of the word 'specific,' as applied to these diseases, presupposes a specific origin for each, an origin, that is to say, from a pre-existing case of the disease by means of a specific or organised living germ. The specific origin of most of the communicable diseases can hardly be doubted. The eruptive diseases are specific and they breed true, and the infection cannot arise *de novo*, but must be sought for in a pre-existing case."

No one would be so foolish as to undervalue the enormous labours and interesting results for which we are indebted to the bacteriologists. We may regret the barbaric nomenclature with which they have enriched pathology, and the more recent scientific jargon in which they have seemed rather to cloak than to elucidate the latest explication of the interaction of the body fluids and cells on the one hand, and the invading microbes on the other. Sanitarians need not, however, be discouraged by some extreme developments which have emanated from the laboratory, or regard their occupation as superseded and their hygienic principles discredited. There has been a tendency from the earliest days of bacteriology to lay claim to more than can be proved, and a more modest pretention might have averted not a few lamentable mistakes. Thus one of the earliest claims put forward by Simon on the strength of Sanderson's and Klein's investigations was the so-called microphyte of *variola ovina*. My Lords of the Privy Council were informed in 1874 that this organism had been identified with a "completeness not yet attained in regard to any other such case; and these results of his (Klein's), while they complete, as regards the special disease in question, the broad pathological outline which previous inductions had rendered probable, must also be regarded as tending very importantly to confirm, while they illustrate, the general doctrine of the vitality of *contagia*." Two years later, however, my Lords were informed that Dr. Klein was mistaken, his findings were withdrawn, and any organism as the cause of *variola ovina* is still to seek. On the other hand, anthrax and tubercle, glanders, cholera, tetanus, diphtheria, typhoid, intermittent fever, syphilis are held to have successively yielded up the secret of their causation, and the belief is widely held that all *contagia* are particulate, either bacterial or protozoal in their nature. The

theory must not, however, be ridden too hard; thus Simon Flexner last winter, lecturing in London on recent advances in relation to practical medicine, said:—

> "Bacteriology has up to now distributed its favours unequally, but we must not be daunted by this circumstance. It has yielded, in some instances, knowledge of diseases of small, and withheld in others knowledge of diseases of great importance. In respect of the common and highly contagious diseases, measles and scarlet fever for example, the progress has been slight."

It was a desire to harmonize the teachings of the bacteriologist and the laboratory on the one hand and the practical experience of the sanitarian on the other, that led me in the year 1881 to make a communication to the *Lancet* in regard to "Blood diseases and the germ theory," in which I enquired "Is not the theory of specificity swallowed up in the larger theory of evolution? As with animals so with diseases, may we not henceforth regard the several species and genera as descendants from a common ancestor . . . . the non-specific developing specific characters, the homogeneous becoming heterogeneous? . . . . The common ancestry of specific diseases once recognised would do much to remove the hard and fast line so often drawn between disease and disease in text-books and dissertations, but of which nature knows nothing." Three years later in an essay dedicated with permission to Mr. Herbert Spencer, who regarded it as opening the way to a considerable reform in pathology, I dwelt on the specificizing influence of soil upon seed, and the predisposition of the individual body; I urged also that specificity and infectivity could be, and were, evolved from common antecedents and conditions, and that in the genesis of zymotic disease these were often associated with filth and mal-hygienic environment. "That organisms of an indifferent nature are capable by cultivation on suitable soil of taking on noxious and specifically noxious properties." At the Sanitary Congress at Worcester in 1889, I restated the thesis, contending "that in organisms whose cycle may be less than an hour, and whose rate of propagation is incalculable, evolution must be powerfully at work eventuating in the survival of those most fitted to their environment," and in the subsequent discussion this view began to receive a certain amount of assent. A similar contention in more popular attire was contained in my lecture to your Congress at Manchester in 1902; meanwhile, in Stevenson and Murphy's "Treatise on Hygiene and Public Health" reference was made to my papers of 1884 and 1889, and it was admitted "that evolution in connection with epidemic diseases, or more strictly their causes, is day by day forcing itself more prominently upon our consideration."

In 1896, in Lister's operating theatre at King's College Hospital, with the Bishop of Exeter in the chair, I read a paper entitled "Pasteur notwithstanding," in which I said:—

"Pasteur's rigid method of chemical observation had been applied to biological questions to some purpose. His differentiating mind had found the essence of the problem to lurk in the *quantité négligeable* of others; to him the very dust in the balance contained pregnant possibilities. From his conclusion that fermentation was essentially biological and that each form of fermentation was due to the propagation of a specific organism, each after its kind, Pasteur was led by easy stages, and by innumerable experiments, to decide against 'spontaneous generation,' and to maintain that no microscopic organism appears except from pre-existent similar organisms. Pasteur, who had nevertheless shown that products of organic life were chemically similar in composition to products of organic activity and exhibited only physical differences, if any, to the observer, was thus led to erect an insuperable barrier between the living and the non-living, and in doing so seemed, as the result of his objective methods, to traverse the conclusions towards which philosophy in its positive tendency was moving when it postulated that there was no force without matter, no matter without force, and that vitalism was a myth of the schoolman. Robert Boyle had said that he who understands fermentation would be able to give a fair account of certain infectious diseases. Fermentation was the starting point in Pasteur's doctrine. Is fermentation always biological in its nature? How far is the chemical change with which it is associated dependent on organic life? . . . In the case of many chemical processes attributed to fermentation it seems to be true that the ferment only facilitates a change which may be effected without it. . . . I have no desire to raise again the conflict which raged over the question of spontaneous generation; the philosophic writings of Dr. Bastian appeared to me always to have met with scant courtesy at the hands of Pasteur, when he denounced the heresy of their author at the International Medical Congress in 1881. Many of Dr. Bastian's experiments may be open to criticism . . . . but his arguments have never been refuted. The whole tendency of modern science has been to emphasise the orderly continuity of nature: *natura non facit per saltum;* the arbitrary distinction between species and species has been modified, the sharp line of demarcation between animal and vegetable has been rubbed out; with La Place and Darwin together we are called upon to contemplate an evolution from gas to genius. Is the line between the organic and inorganic alone to persist? Is not the *de novo* origin of life, and by that I do not imply spontaneity, corollary to evolution in its widest conception? How are we to account for the lowliest and least differentiated organisms of to-day if evolution by natural selection be for ever at work? The experiments of Pasteur, with test-tubes and non-putrefying putrescible fluids, were doubtless conclusive as far as they went; but I would submit that the possibilities of environment are not exhausted by the confectionery of the laboratory, by solutions of ammonium tartrate, etc., or even glycerine agar-agar in a test-tube. Still less is the mystery of life solved by reference to a remote epoch, or a stray meteorite, or the cooling-down process of the earth, all of which explanations remind one of the fairy tale with its reassuring preamble, 'Once upon a time in a country by the sea.' Let us be content, if you please, to allow

that of the origin of life we as yet know nothing, but let us avoid too rigid generalisations as to its impossibility on the strength of the scanty observations we are able to make in the limited possibilities of the laboratory."

As the *British Medical Journal* observed (June 7th, p. 1235):—

"The sacerdotal dogmatism which used to prevail among doctors has now been banished from the ward, and has found a refuge in that very modern shrine, the laboratory. The debt which practical medicine owes to research is incalculable, and without it progress would be impossible. But the laboratory worker is not always in perfect sympathy with the practitioner, whom he is, perhaps, too apt to look down upon. And it cannot be denied that from the laboratory have come a number of vain things which have given cause for irreverent laughter to mockers at medicine."

"The cure of consumption," as proclaimed by Koch, has been a sorry disappointment, and the most recent lecture by Dr. Batty Shaw is far from reassuring. The distinguished discoverer of the "Bacillus tuberculosis" was on safer when on sanitarian ground, and in a late pronouncement declared:

"It is the overcrowded dwellings of the poor that we have to regard as the true breeding places of tuberculosis; it is out of them that the disease always crops up anew, and it is to the abolition of these conditions that we must *first* and *foremost* direct our attention if we wish to attack the evil at its root, and to wage war against it with effective weapons."

The researches of Drs. Thiele and Embleton, published in the Proceedings of the Royal Society of Medicine last February, according to the editor of the "Universal Medical Record," if confirmed, will cause "practically the whole of the enormous superstructure which has been reared on the basis of conventional bacteriology of the last twenty years or so to go by the board." He proceeds: "Views which, although supported by clinical observation, have been held heterodox, may now be brought out into the light of day, and the importance of the man in respect to the microbe may perhaps be freely acknowledged." Reference is then made to my lecture before your Congress in 1902, and it is asserted that:

"Our clinical eyesight has been blinded far too long by the dazzling effulgence from the laboratories, that has revealed to us much, certainly, but that has hindered the recognition of a great deal that lies immediately before us. . . . . We must regret that so much sound clinical observation on the origin of disease has been virtually hushed up by reason of the fashion that has acclaimed so long and persistently the doctrines of bacterial specificity and immutability."

Recent investigations have tended to confirm earlier generalisations as to the *vis medicatrix naturæ* and the powers inherent in the healthy body

which enable it to resist the invasion of noxious agencies. Lister himself dwelt upon "the new and surprising light which has been thrown upon the means with which the living animal defends itself against their (*i.e.*, microbic) assaults," and earlier in his researches (1881) he had contended that "it had been abundantly established that in the healthy state of the animal body there are no micro-organisms present in the tissues .... It is only in a state of unhealthiness that the ordinary forms of bacteria can enter the circulation and establish themselves in the organism."

Nevertheless, there is a school of thought which is active and fashionable to-day, which delights in running counter to all those canons of hygiene which the earlier sanitarians taught with a fervour which was moral, if not religious in the loftiness of its appeal. That school appears to deprecate physical exercise, fresh air, and cleanliness, as if they were sanitary superfluities. Under the obsession of the microbe they have learnt to regard the employment of such agencies against epidemic diseases as "dreadful superstitions." When such views were propounded to the National Health Society a couple of years ago, it was not surprising that the *British Medical Journal* should have denounced the deliverance as a "gospel of dirt" and satirically suggested that Benedict Joseph Labre, who penitentially devoted his body to the culture of *pediculi*, should be adopted as the patron saint of so filthy a cult.

Let us by all means pay proper homage to the revelations of the microscope, let us pursue the infinitely little until it is lost in the metaphysical realm of the ultra-microscopic, but let us not forget the weightier and more massive considerations of the physical, mental, and moral effects of a sanitary environment as earlier hygienists like Chadwick conceived them. Let us by all means pay tithe of mint and anise, and cummin and rue, but let us not omit from our calculations the weightier matters of the law of healthy living, else we shall be justly open to the reproach, "these things ye ought to have done, and not to have left the others undone."

CONGRESS AT EXETER.

POPULAR LECTURE.

By SIR JOHN McCALL, M.D., LL.D.,
Agent-General for Tasmania.

IMPORTED FOODS, FROM A COLONIAL POINT OF VIEW.

WITHOUT fully realising all the difficulties that would face me in attempting to prepare a popular lecture on "Imported Foods, from a Colonial Point of View," I consented to essay the task, but have been puzzled to know how it would be possible to treat such a subject for a popular lecture.

Shortly put, I think I can say that the colonial point of view in connection with the food supplies which the mother country finds it necessary to import is that so far as possible such goods should be imported from this country's colonies. I trust that that is a view which will be shared by all British people. We are not concerned with the arguments now being put forward by those whose desire is to specially tax agricultural land. These gentlemen say that if landowners are sufficiently taxed they will be forced to put their land to better use, meaning, I suppose, more remunerative uses, and that in this way the United Kingdom would more nearly supply the food wants of the people. Whether these reformers mean to have the public parks and beautiful homestead areas ploughed up and sown with wheat and potatoes I know not, but I do know that in many lines of production your rich little country is much more wonderful than people generally realise. When one thinks of the large areas required as pasture for the cows now supplying milk for your millions, one is surprised to learn that no less than 60 per cent. of the meat consumed in the United Kingdom is produced within its own limits.

However, I am not here to argue that more should not be done in the way of home production if it is possible to do so, but I venture to assert that if this country's manufacturing industries continue to grow, or even to hold their own, it will never again grow all the food requirements of its people. Again, we find that all, or practically all, the great and growing foreign countries which have in the past exported meat and wheat, particularly to Great Britain, are finding that they require for their own

consumption more and more of their food products, with the result that they have less to export. This shortage will be greater as time goes on, and therefore, without any consideration of the advantages of increasing the trade within the boundaries of the Empire, business caution should lead you to give encouragement to those portions of the Empire suitable for producing the food products you require to import, as even now you require to import from other parts of the Empire what I might call the balance of your requirements, and if I am right in what I have referred to, the shrinkage of the amount available from foreign countries, this balance must be an ever-growing quantity.

With Canada, Australia, and New Zealand, where the customs duties imposed on imports are directed to the end that protection may be secured for producers and manufacturers, it is a comparatively simple matter to arrange for reciprocity, or the more partial policy of preference. There they have a tariff to bargain with, here it would be necessary to impose duties which would protect the agricultural producer of this country in certain lines against foreign producers, and remit or reduce the duties in favour of like products from the British Dominions.

In a word the dominion policy lends itself to a policy of preference, while your policy would have to be changed to enable you to give preference in the same manner.

It is not for me to presume to supply a policy for you, and I am sure the colonial view is that, however favourable they may look upon a proposal to give them a preference in your markets for their food productions, they do not expect to see you adopt a protectionist policy if you are satisfied that it would be unwise to do so, simply for the purpose of giving them a preference; and I am sure that in no case would the Australians ask for the adoption of a policy that would increase the cost of food stuffs to the poor of this country. It is for your statesmen to say how it can be done, and I feel confident that they will yet solve the difficulty; indeed, I am sure it would soon be done if the best brains of the House of Commons could approach the subject without party consideration.

In passing, let me say that in spite of our Australian preference to Great Britain, in the matter of a few years Germany has acquired quite a substantial trade in the Pacific by means of subsidies to their shipping. This has given them a place they would not have retained in competition with the British under like conditions. If business tariffs cannot be arranged owing to your free trade policy, and I do not presume that they should be so arranged, I would ask, is it impossible for this country to subsidise British ships so as to get them to carry food supplies from the

dominions to your people in return for the preference they now give? I am inclined to think that such a policy as this will soon have to be adopted quite outside the question of giving a return to the dominions for the preference they give the manufacturers of this country, and might I put it to you that five per cent. is no mean preference. In many branches of trade it amounts to a respectable profit; but this five per cent. is not the only preference given by the dominions to the manufacturers of Britain.

In my own State the Government, as well as other authorities, make large purchases for public purposes, and my instructions are to call tenders only in the United Kingdom. We do not invite tenders from foreign countries. In some lines, at any rate, this means that we pay higher prices than it would be absolutely necessary to pay; indeed, we stick to the old land, though we frequently see public bodies of this country calling for tenders on the Continent for materials, whilst we limit our tenders to the United Kingdom.

When I say you may have to do something to get the food, I have in my mind the fact that other countries are beginning to compete for it. They are lessening their protection, and their more stringent conditions are being relaxed. I do not know about wheat, but so far as meat and fruit are concerned they are offering us a good market, and large quantities of Australian fruit have been sold this season in Hamburg, and ships are being built in Germany in anticipation of largely increased shipments. When I admit, as I do fully admit, that the shipowners of this country are supplying first-class steamers to carry our products here, I believe I have said all that can be said about your support of trade between the colonies and the mother country. On the other hand, we have done much to establish and preserve trade by our preference to your manufacturers, and by the introduction of cold storage.

By the aid of refrigeration you are now able to draw supplies of absolutely fresh food, such as meat, butter, cheese, and fruit from all parts of the world. Steam has annihilated distance, and refrigeration, produced largely by the aid of steam, has overcome the tyranny of seasons. Before the days of refrigerating machinery you could not get spring, summer, or autumn produce except in the seasons, unless such produce could be grown under glass; but now you have plenteous supplies of spring lamb delivered to you fresh in the midst of winter; fresh apricots, peaches, and plums during the months of January, February, March, and April; pears and apples grown in their proper season are kept fresh under refrigeration right throughout the year, whilst the summer and autumn

production of pears and apples in Australasia is brought to you for consumption between April and July, the very months when those who produce them are eating them when at their best and in their proper season.

As population increased in the United Kingdom, and manufacturing industries absorbed so much of the labour previously available for agriculture, it became necessary to obtain supplies of food from abroad, and as you are a flesh-eating people, meat was one of the foods which had to be brought here in some form. There was, of course, a certain trade in live cattle, which continues in a small way even up to the present. Canning was resorted to in countries where meat was plentiful and cheap, but neither of these methods could provide what was wanted. "For the quinquennial period, 1861–65, the average quantity of fresh beef, mutton, and pork imported amounted to only 0·1 lb. per head of the population. The coming of frozen meat in 1880 sent up the average imports for 1881–85 to 3·5 lbs. For the five years 1891–95 the average imports were 12·4 lbs., and for 1906–10 each unit of the population was provided for to the extent of 28 lbs. of fresh meat imported from British possessions and foreign countries." Very many attempts were made to preserve meat, and some 200 patents were registered for preserved meat processes, but the solution came not so much perhaps from Britain's want, as from Australia's need to find an outlet for the surplus stock its pastures were yielding.

In 1861 the late Thomas Sutcliffe Mort established at Darling Harbour, Sydney, New South Wales, the first freezing works in the world. Mr. Mort was a Lancashire man, born in 1816, who emigrated to Australia in 1838; he spent a large fortune, said to have totalled £80,000, in connection with his freezing experiments. James Harrison, a Glasgow man, born in the same year as Mort, and who emigrated to Australia about 1837, settled at Geelong in 1840 and took up journalism. In 1850, as a sort of side-line, he worked out an ice-making scheme, and in 1851 had the satisfaction of seeing a refrigerator installed in a brewery at Bendigo, Victoria; this is said to be the world's pioneer of these machines. At Melbourne, in 1873, he publicly exhibited his machine for freezing meat, poultry, fish, etc., and six months afterwards this food was consumed at a public banquet. Harrison was therefore ahead of Mort, who also arranged a lunch in September, 1875, to which 300 people sat down and consumed food that had been kept from June, 1874, but neither of these pioneers succeeded in getting cargoes to this country. Indeed, the failure of Mort's attempt is said to have been such a terrible blow to

him that it hastened his death, which took place in 1878, and Harrison's failure in 1873 ruined him.

A Frenchman, Charles Tellier, was the first to succeed in getting meat carried through the tropics. He made an attempt in 1868 with some 12 cwts. of beef shipped at Monte Video to France, but twenty-three days out an accidental breakdown of his apparatus upset calculations, and the meat was eaten on board the ship. In 1876 he managed to get a small quantity of meat carried safely from Rouen to Buenos Aires, and in 1877 solved the problem of carrying a larger quantity from Buenos Aires to Rouen, and landed much of it in good condition after a voyage of 104 days. Next year 5,500 carcases of mutton were safely carried from Buenos Aires to Havre, and from that date progress has been rapid. Far off New Zealand alone now sends you some four millions of carcases of mutton yearly, and between 1882 and the present over eighty millions of carcases have come to this country from the land of the Maoris. Australia also sends very large quantities from Queensland, New South Wales, Victoria, and South Australia, whilst the trade in frozen meat with the Argentine has assumed enormous dimensions.

Butter and cheese are two other excellent foods which refrigeration has enabled the dominions of the Empire to send you; these products of the dairy coming to you almost daily in the very best condition. Butter is now made in tropical Queensland, where the luxurious pastures which result from the heavy rainfall and warm climate, provide ample fodder for cows the whole year round, and successful dairying can be carried on under modern methods by the aid of refrigeration. The southern States of Australia and New Zealand send you large supplies of butter and cheese, but with them it is particularly a seasonal trade, whilst Queensland can make and ship in quantity all the year round.

Fish, another important item of food, has also been made available to hundreds of thousands of people by the aid of refrigeration, although the salt, dried, and canning industry, as applied to fish, is still a most important factor. Fish supplies from abroad are, however, mostly in the canned form, if we except a few consignments of Siberian salmon, and most of the canned fish coming from a distance hails from Canada. It is needless to say much of the fish industry in this country other than to call to mind that, whilst the canning of herrings has been long practised, it is only since the use of ice and refrigeration by machinery that every town and village throughout the United Kingdom has had a constant supply of fresh fish.

Perhaps the greatest triumph of all in connection with the importation

of food, and the one which has made your modern commerce differ so much from that of half a century ago, is in the carriage of delicate fruits of the temperate, tropical, and torrid zones to your markets. For the initiation of this and its successful establishment, I must claim credit for the State which I have the honour to represent in this country. Tasmania produces the finest apples, pears, apricots, plums, raspberries, currants, cherries, and gooseberries to be found anywhere. Our people were hampered by the high tariffs of the sister States (colonies as they then were) during the early eighties, and were compelled to look elsewhere for a market. It occurred to some of our growers that England might provide the market if only refrigeration would enable us to land our fruit here in sound condition. The fruits referred to, which by the way are known as English fruits, begin to mature about Christmas time, they reach this country about March, and continue right on to June. Most of the early shipments, which began about 1884 (a consignment of 400 cases having been sent in that year by the s.s. "Warwick"), were not landed in good condition; but as some of the fruit landed sound, it was felt that success must come in the end. That it has is sufficiently explained by the magnitude of the shipments from Australia which now come to you yearly, upwards of twelve hundred thousand bushels of apples, and a hundred thousand packages of pears being landed in London, Liverpool, and Hamburg during the 12 to 14 weeks included between March and June. Of this total Tasmania usually supplies about three-fourths: this year, the crops in the island being somewhat light, only about half the total belonged to Tasmania.

Following Tasmania's lead, other States of Australia, New Zealand, South Africa, the Argentine (to a small extent), the West Indies, California, and Florida have developed an enormous trade in fruit, which without refrigeration or special methods of cooling and ventilating the holds of steamers would be impossible. The result is that, whilst fruit producers of this country can only market their output in the proper season for the same, your consumers find almost every kind of fruit the world produces constantly in season. Apples grown in your own latitude are now kept in cold storage from autumn to spring, and tropical fruits, such as bananas, pineapples, mangoes, and grape fruit are made available to you practically at all times, quite a large fleet of steamships being employed in bringing these fruits to your shores the whole year round. The people of this country do not eat sufficient fruit, but the consumption is gradually increasing, and it is certain that when prices are within the reach of all an enormous increase of consumption will follow.

In connection with fruit, reference must also be made to the enormous quantities which are canned in syrup and water, and also that which is made into jam; but with regard to the last-named article, very little is imported from abroad, the reason being that the duty on sugar makes it expensive, and people in this country, although quite content to eat canned fish and canned meat, do not like the idea of canned jam. Tasmania, however, sends large quantities of what is called "fruit pulp," which is nothing more nor less than such fruits as raspberries, currants, gooseberries, apricots, etc., boiled a certain time and then hermetically sealed in cans, to be later on made into jam. Some prejudice exists against jam made from what is call pulp, but the only difference is, that there is a slight loss of colour and aroma, due to the extra boiling, the fruit being just as wholesome as ever.

Speaking for Australasia, which includes Tasmania, and also for New Zealand, I can state positively that our legislation in connection with the purity of food secures a very high standard of purity in the foods for consumption and export, indeed, I think in some directions we have fair grounds for complaint. For instance, there is a most rigid inspection of the butter sent over to this country; the amount of moisture that it is allowed to contain is a low percentage, so low indeed, that very little of the Australian butter goes into consumption in this country without having a proportion of water or milk added to it. As representing the producer, I would make the claim that he is more entitled to the profit on the water than the middleman. For Canadian wheat no guarantee is required from me.

The Dominion Government take steps to see that only good sound foods are exported. If the best of these are sold in this country as the best English, we cannot be held responsible for it, any more than I can prevent traders from ticketing their apples as Tasmanian when they have never seen that State. We have to acknowledge that the quality of the meat must be exceedingly good if it can be passed off as English; if it were inferior the public would soon resent it.

In the foregoing I have abstained from the use of many figures, for had I used them as freely as one would have liked in dealing with a subject of this kind, it would have been inappropriate to a popular lecture on such a subject as that set down for me this evening.

I shall now have pleasure in showing on the screen some pictures illustrating the food-raising industries of the different dominions.

Volume XXXIV. No. 8. Issued September, 1913.

JOURNAL

OF

THE ROYAL SANITARY INSTITUTE

CONGRESS AT EXETER.

Section A.—Sanitary Science and Preventive Medicine. Presidential Address, by A. WYNTER BLYTH, M.R.C.S., F.I.C., F.C.S., (VICE-PRESIDENT), President of the Section.

IMMUNITY AND RECENT PROGRESS IN PREVENTING PREVENTABLE MALADIES.

IT is the chief aim of preventive medicine to confer upon the individual immunity from all disease, hence I need not apologise in making the subject of immunity with regard to special diseases the main theme of my opening address.

Immunity is a fascinating study. Immunity is one of the chief weapons which Nature uses to preserve the higher animals from attacks of myriads of lowly parasitic forms which would otherwise annihilate them. Why does not a vaccinated person catch smallpox? Why are some people apparently immune from virulent infections they are in contact with at some period, at another fall victims to the same infection?

Why is the protection of a single attack of scarlet fever so complete and enduring in one case, so feeble and evanescent in another?

Why do some people catch almost every infection they encounter, and show but little or no resistance to repeated infections of the same fever?

These are a few of the problems to be studied; problems the solution of which has a distinct practical application.

The practice of vaccination, enforced for so many years, has rendered the idea of acquiring immunity familiar. Most people know that passing a virus through an animal modifies its properties. The vaccine

lymph or serum is an example of attenuation. Smallpox has been transferred to an animal, and the bacteria of smallpox have had their virulent properties lessened by the process.

The prevention of rabies by attenuation of virus, the inoculation of a serum against cholera, the use of anti-toxin in diphtheria are all really extensions and applications of the same principle.

The Opsonic Index.

In connection with this subject the opsonic researches of Sir A. E. Wright and his school are most instructive; it has been shown that the opsonic index, that is the power of phagocytes to deal with hostile bacteria, varies in individuals, and at different times in the same individual. A new method of treatment has been founded on these facts; for when the opsonic index is low as regards a particular microbe, it is capable of being raised by suitable subcutaneous injection of sera prepared from artificial cultures of the same microbe; the great success that has *inter alia* been obtained with regard to boils caused by an invasion of the staphylococcus aureus by this treatment, shows that the principle is sound. With farther elaboration of technique, it seems certain that this new weapon in curing and preventing disease will be of the greatest utility.

Mechanism of Immunity.

The mechanism of immunity was indicated by the discovery of Pfeiffer, often described as Pfeiffer's phenomenon. The cholera vibrio disintegrates under certain conditions, *e.g.*, if a guinea-pig is made immune against cholera, and cholera vibrios be introduced into its abdomen, they are disintegrated and dissolved; the same thing occurs in normal guinea-pigs, provided immune serum is present; but if the guinea-pig has not been immunised, or if immune serum is not present, the vibrios increase and multiply.

This solution of the bacteria, called bacteriolysis, is similar to a solution of the red blood corpuscles (hæmolysis), and a study of hæmolysis throws great light on bacteriolysis. Bordet* treated guinea-pigs with defibrinated rabbit blood, the guinea-pig blood thus treated rapidly dissolved the red corpuscles of rabbit blood, but had no effect on pigeon blood, nor on the red corpuscles of normal guinea-pigs. Ehrlich injected a goat intermittently during eight months with sheep serum rich in red corpuscles; serum of this goat then dissolved sheep blood corpuscles, while the serum from normal goats did not have this property. On heating the serum to a

---

* Annal. Inst. Pasteur, XII., 10.

moderate heat, 56° C. (132·8° F.), it loses this solvent action, but may be made active again by the addition of a little normal serum.

From these experiments it would appear that there are at least two substances present which confer upon the serum its solvent action: the one to some extent resistant to heat (thermostable), the other susceptible to heat (thermolabile).

Besides these "lysins" there are substances in the blood which cause bacteria to clump together, and are hence called agglutins. Metschnikoff considered the role of the phagocytes (the white blood corpuscles) the most important: the white blood corpuscle either devoured the bacteria or was overcome by their number or virulence. On the other hand, in an immune person the white corpuscle had been educated to resist, and conquered more or less easily the invading bacteria. Wright and Douglas, however, have shown by experiment that the serum acts specifically by means of what they call its opsonin on the bacteria, and then only are the phagocytes able to successfully attack the bacteria.

Ehrlich has erected on the base of these and other experiments an elaborate theory. He imagines the protoplasm has side-chains similar, I presume, to the side-chains of the benzene ring, and that "anti-bodies," that is to say, substances hostile to any particular infection, are produced by a constituent of the bacterial cell, or the blood corpuscle unites chemically with a side-chain, and thus forms a new body (hence, a kind of neutralisation); if the invading substance, for example, a toxin, is soluble, the neutralisation proceeds in the solution; if, however, it is not directly soluble, being originally insoluble (part of, say, a bacterial or blood cell), then the dissolved "anti-body" will be abstracted from its solvent fluid and anchored by the cell particle. He imagines that the side-chains possess definite atomic groups, able to combine with certain other atomic groups, and so increase the protoplasmic molecule. The toxin combines with the side-chains of a cell, upsetting equilibrium; the stimulated cell manufactures a new series of side-chains in excess of what is required to neutralise the toxin, these are cast off and appear in the blood as antitoxin. The theory is farther elaborated, and the student labours through an intricate maze of new terms, such as "complement," "interbody," "receptor," "toxiphore," "haptophore," "amboceptor," and so forth.

The suggestion of Dr. Mellanby* is simpler, viz., that the production of antitoxin is due to an active secretion by the leucocytes (phagocytes), caused by the injection of toxin molecules; if this is accepted, the opsonin

---

* Proc. Roy. Society, 1908.

of Sir Almroth Ed. Wright is simply the toxin elaborated by the invading microbe and taken up by the serum, and this substance excites and stimulates specifically the phagocytes.

Immunity and Malaria.

Natural immunity is well exemplified in the case of malaria and the ordinary gnat.

The organism causing malaria in its cycle of life assumes a bewildering number of forms, according to the stages of development, and according as to whether it is in the blood of man or in the body of a mosquito; in the first place, if taken by any other species besides a particular species (anopheles) the blood with the malarial sporonts is digested and dissolved, the ordinary gnat tribe in other words is "immune," and dissolves and disintegrates the sporonts, just as in Pfeiffer's phenomenon the cholera vibrios are dissolved and digested in immune serum.

But given an anopheles, the sporonts male and female develop; the male develops an active spirochete form, which fuses with the female form, and from this fused form (Zygote) there is developed a short worm-like body, which rounds itself off to a cyst, the cyst ultimately becomes full of spores, which develop into minute active slender organisms; these escape from the cyst into the salivary glands of the anopheles mosquito, and flow out into the blood of the host when the minute vampire is sucking the blood of its victim.

These active moving threads get into the blood corpuscles of the host, make, as it were, a spore case of the blood corpuscle; in the final stage the spores, like the slender threads, penetrate the blood corpuscle, and have a similar history, so that the cycle in the blood goes on for a long time asexually, until a time comes when, probably stimulated by the resistance of the host, certain of the schizonts develop into the so-called sporonts; these sporonts are then ripe for development in the anopheles mosquito.

Natural immunity may be acquired through attenuation of the invading organism by passing through many generations of a particular species. Sometimes this immunity is complete, that is to say, the parasite refuses to multiply; in others the parasite lives comfortably in the host, causing no annoyance whatever.

The probability of Pathogenic Micro-Parasites having evolved comparatively recently.

T. brucii, the cause of a fatal malady to domestic animals and propagated by the tsetse fly, occurs as a natural parasite in wild game in India, and is quite harmless; probably when it first invaded the game it was

fatal to a large proportion. A trypanosome (*schizotrypanum cruzi*), which passes one stage of its life in a bug, Chagas found, on inoculating guinea-pigs, killed them within a week quite regularly and uniformly, but the trypanosomes by repeated passages through guinea-pigs became far less deadly, so that although most of the later inoculations were fatal, yet death was delayed for six weeks; hence the *T. gambiense*, the cause of sleeping sickness, has probably only comparatively recently attacked man. Parasitic diseases as time goes on tend to become less fatal; by continuous cultivation in the same host harmonic relations ultimately result. As a fact infectious diseases generally are less fatal than in past history: the excessive mortality of the Black Death and of the Sweating Sickness of the Middle Ages has been attributed to the defective sanitation of the period; but it may be that the main cause was that the human organism was then first invaded with the particular parasite, and dirt, overcrowding, and the general absence of modern and effectual methods for the removal of effete matters from the dwelling, were important but subsidiary causes.

Some parasitic forms continue to multiply, but in no way affect health, and immunity is obtained without constitutional disturbance. The trypanosome of the rat, *Trypanosoma lewisi*, is an example.

The life cycle of this protozoon is remarkable: beginning with the rat flea, it multiplies within the body of the flea in vast numbers and then infests the rat; the trypanosomes multiply in the rat's blood from the 8th to the 10th day, and then the multiplication declines and gradually ceases: the blood, however, still swarms with the trypanosome for from one to two months. Sooner or later the rat becomes entirely free from the parasite, and is absolutely immune: it can never be infected with the same species of trypanosome.* During all this time the infected rats are quite healthy, the swarms of living foreign bodies in the circulation cause no fever, no rise of temperature, no interference with any bodily function, and yet immunity is produced. On the other hand, immunity in man to various maladies is usually attained only after some more or less disturbance of function, local or general.

THE CHLAMYDOZOA.

Minuteness in size of the parasites presumed to be the cause of scarlet fever, measles, smallpox, and foot and mouth disease, and the failure to cultivate them with success on artificial media, are the chief causes why the complete life history of these parasites is not at present known.

The parasites are now believed to belong to a special class named

* Minchin: An Introduction to the Study of the Protozœ. London, 1912.

Chlamydozoæ (χλαμύς, a mantle), just visible dots under the highest powers of the microscope, enabling them to pass through the finest bacterial filters. They enter into the cells of the body, and are specially characterised by their mode of division: dumb-bell figures are formed, "two dots are seen connected by a fine line like a centrodesmose which becomes drawn out until it snaps across the middle, and its two halves are recontracted into the body"; the cells infected extrude nucleolar substances, which envelope the parasite as in a mantle, and produce appearances which have been mistaken by various observers for the actual cause of the malady.*

Just the same (letting for a moment our imagination run riot) as if the intelligence in another planet, observing the denizens of the earth, would make two different species of man clothed and naked, considering the chlamys or cloak of clothing an essential part of the human microbe.

If it ever becomes possible to study the complete life-history of these cloaked forms with the same precision as the life-history of ordinary bacilli, and to cultivate them in nutrient soil outside the body, we are far more likely to be able to devise direct measures, both preventive and curative, for dealing with the maladies they cause. It is this class of diseases which confers the most striking instances of immunity, an immunity in many cases extending during a long life-period; yet there are exceptions. One sees occasionally a person badly pitted with smallpox die from a second attack. There are persons who seem so little able to secrete anti-bodies that they not only catch most infections they come in contact with, but the same infection several times.

IMMUNITY AND TUBERCULOSIS.

It would appear that the tubercle bacilli, in common with other disease-producing micro-parasites, contain and produce a toxin (a poison) which in certain quantity inhibits the growth of further bacilli. Tuberculin is a serum or liquid prepared from the tubercle bacilli, but destitute of living bacilli itself, and if injected under certain precautions into a tuberculous animal, it induces more or less fever, and is thus a valuable test of existing tuberculosis; it is also believed to be a curative agent, hence its somewhat extended use in the human malady. The same effect is produced naturally, when from some transient exertion colonies of quiescent tubercle are apparently set free and become active; hence many physicians keep their tuberculous patients tranquil and then encourage a slight attack of fever by brief exercise or work. It is believed that these

* Minchin: *op. cit.*, p. 472. Hartmann, M., 1910: Chlamydozoæ, *Cent. f. Bakt.* Jena.

successive attacks of fever, that is, successive doses of the toxin, confer what may be called curative immunity. After death, in a large number of the population, old healed tubercles are found in the lungs, showing that these persons at some former period have had a slight attack of tubercle. It is probable that children and young persons who have an early localised attack of tubercle and completely recover without damage, are more or less immune and are more valuable assets to the nation than those who are not so protected. The tuberculin treatment is still on its trial, but the evidence on the whole is that in early cases it does good.

Whether it is practicable to prevent tuberculosis among a general healthy population by a course of graduated tubercular inoculations is unknown, and no one has been bold enough to suggest it.

IMMUNITY AND CANCER.

Out of every 7 women and every 11 men over 35 years of age, one of each die of cancer annually, and as age progresses so does the liability to cancer increase. During recent years, from various causes, civilised man on the whole has attained to a greater mean age, and necessarily cancer has increased. If, indeed, we study statistics we may be alarmed at the increase. In England the cancer mortality for women in 1860 was 500 per million, and 1,860 per million in 1909, the figures for men being similar, viz., an increase of from 200 to 800 per million. But recent analysis has pretty clearly shown that much of this is due to more correct diagnosis: numbers of deaths really due to cancer in, say, 1860 being returned as due to "old age," "stomach disease," and other equally vague causes.

It is, at all events, clear that cancer has not diminished, and since the chances are, say, only about 10 to 1 that we escape, it is obvious that such a serious dread malady demands research. The whole world may profit by its successful issue.

Since the publication of the first scientific report of the cancer research fund in 1904 there has been a large amount of most interesting and important research cancer work done systematically and scientifically by Dr. Bashford and his collaborateurs in this country, and also in France, Germany, and America. They found that cancer is by no means peculiar to any special race of man; it occurs in all races, in all domestic animals; it has been found in various wild animals, in reptiles, in fish, in fact in the whole of the vertebrate; in whatever animal it is specially sought, there it is ultimately found.*

* Scientific Reports on the Investigation of Cancer; Cancer Research Fund, 1904–1912.

It is a matter still of doubt whether the cause may not be, say, some minute germ like the microsporidia,* which stimulates the natural cells to an aggressive and peculiar activity; but if it is due to a germ, the general course of the disease is *sui generis*, and is extremely unlike the known bacterial diseases.

The living cancer cells can be cultivated in animals of the same class, and when once the technique is acquired, cancer may be grafted, say, from one mouse to another with great certainty. It is this successful grafting that has shed so much light in recent years on the mechanism of malignant growth.

Spontaneous cancer is a malady of the mature and aged, yet curiously enough young animals are more susceptible to inoculation than old animals.

Dr. Bashford and his co-workers have discovered that mice may be made immune to transplanted cancer by inoculations with the normal tissues of another mouse, such as defibrinated blood, liver, spleen, testis, mammary gland, kidney, placenta (blood free), entire embryo, embryonic skin, and so forth; of all these, embryonic skin and defibrinated blood were found the most convenient. These vary in resisting power according to the inoculated cancerous strain. Embryonic skin was most efficient in promoting resistance against a squamous celled carcinoma; there appeared to be, therefore, some difference in the power to stimulate resistance in these various products.

The resistance is not a mere local resistance, but is distributed all over the body, subcutaneous tissues, peritoneum, internal organs, and even blood, hence it must be assumed that this resistance is due to some substance in the body fluids.

The tissues must be from another mouse; resistance is not enhanced by inoculation with its own tissues.

The grafts, if successful, are rapidly fed and supported by blood vessels and tissue invading the grafts from the healthy tissue. Some strains have exceptional powers of growth. A portion of tumour sent by Jensen of Copenhagen by post to the Cancer Research Laboratory in London was transmitted successfully in 400 animals: "A mass of tumour, 16 lbs. in

* The silkworm disease was investigated by Pasteur, who found that it was caused by a parasite belonging to the micro-sporidia *Nosema bombycis*; the spores are excessively minute, and on suitable treatment may be made to extrude a very tiny filament. Pasteur found that the silkworm could be infected by eating leaves contaminated by the excretions of sick caterpillars, and also that the eggs of the infected females were penetrated by the spores, and lay dormant until the larvæ were hatched. A similar parasite of the same order (*Nosema apis*) is the cause of destructive epidemics among bees. The interest of the malady is that it stimulates the nucleus of the cells of its host, which form and multiply enormously, and suggest that certain tumours in man and mammals may be the result of one of the micro-sporidia.

weight, has thus actually arisen from the original one, and that without participation of the cells of the various hosts, and without manifest change of structure." *

A graft inoculated into an animal which enjoys the temporary immunity referred does not get a supply of blood and tissue, "the cancer cells in the immune animal are lying in a single layer against a solid wall of the host's tissues," † they are within sight of food but none is supplied, and they rapidly degenerate.

Resistance bestowed by inoculation with cancer seems to be no different to that bestowed from normal tissues. Resistance or immunity is also to be found in animals in which a cancerous tumour has been absorbed.

One might hope to apply these facts to render the human race resistant to cancer, but even if the same thing applies to men, the unexpected fact has been discovered that these inoculations do not prevent spontaneous cancer. It is rare that cancer in the human subject is inoculated, hence there is little prospect of success in this direction; besides which the immunity is quite temporary, the maximum is attained in the mouse in about 12 days, and afterwards it gets weaker, vanishing in about 80 days. The temporary immunity of the mouse is therefore highly conditional, and cannot be compared with the immunity conferred by a previous attack of infectious fever.

In 1904 Farmer, Moore, and Walker ‡ read a paper before the Royal Society describing the nuclear changes in the cell of new malignant growths. In a proportion of the cells they found changes parallel to those characteristic of the maturation of the sexual elements of the metazoa. According to Farmer, the cancerous process consists in the transformation of the normal adult tissues into modified reproductive or gametoid tissue which possesses the feature of malignancy. The facts were at first accepted, but later, on restaining and further examination of specimens, Drs. Bashford and Murray arrived at an entirely different opinion.

The etiology of cancer is evidently most complicated, but its nature is gradually being unravelled, and new facts are so continually being brought to light that we need not despair in finding some method of prevention; at present there is none.

Nevertheless, it is a matter of congratulation that it is earlier diagnosed than formerly; that some cases yield to such treatment as radium; that a great many permanent cures are effected by the surgeon's knife; and that a few disappear spontaneously.

* Dr. Bashford, Proc. Roy. Soc., 1904. † Dr. Bashford, private communication.
‡ Proc. Roy. Soc., Vol. LXXII.

It is also obvious that a considerable side light has been thrown by these researches on the general subject of immunity.

Immunity Produced by Chemical Substances.

Where bacteria can be cultivated outside the body, on solid or liquid media, it is quite easy to ascertain the effects of light, heat, drugs, and other reagents on their rate of growth and vitality. One might therefore expect great results from this study; that, however, which is inimical to the life of the lower organism, is, as a rule, also inimical to the life of the higher organism; so there is a difficulty in applying practically the knowledge gained, unless it is found that the parasitic organism is very sensitive to some chemical substance, and the same chemical substance only affects the higher organism to a slight degree.

Even among the vertebrates there are variations to the action of poisons, *e.g.*, the resistance of the rabbit to atropine, and the lower forms of life show still greater variation. The most striking instance of the effect of a chemical substance on minute parasites, is the effect of certain preparations of antimony on trypanosomes; this has been accurately studied in the trypanosome of the rat, and the principle has been applied with success in sleeping sickness. A drop of blood taken from a rat affected with trypanosomes will be found to be swarming with the active parasite; half an hour after injection with the antimony preparation a similar drop of blood shows only here and there a trypanosome, within an hour they will all have disappeared. The action of quinine on the malarial organism, the action of organic compounds of arsenic on the syphilitic microbe, are striking examples of the effective action of chemical substances.

It is quite intelligible why such considerable influence is exercised both on the malarial parasite and the sleeping sickness parasite; they are both examples of parasites that live in the blood rather than in the tissues. Quinine, arsenic, mercury, and other drugs are more or less readily taken up by the same living stream, and are thus brought into contact with the drug. On the other hand, such a parasite as the tubercle bacillus is localised, wrapped up, and protected in the deposits, and only occasionally is carried into the blood stream, hence drugs have not the same opportunity of reaching the bacillus.

The Genesis of the Pathogenic Micro-organism.

From a general study of the life-histories of the protozoa and the bacteria, it is clear that those at present parasitic were not always so; they obtained their food from either dead animal and vegetable substances,

or fed on living forms more minute than themselves. Entamœba coli is an innocuous inhabitant of the intestine; it may, indeed, be useful: a kind of aggressive phagocyte in swallowing bacterial and other organisms.

Entamœba histolytica, on the other hand, attacks the epithelial cells lining the intestine, and may enter the blood stream and cause abscesses on the liver. It is, indeed, associated intimately with tropical dysentery. It is reasonable to suppose that at one time this amœba was a harmless parasite, and by gradual evolution acquired its cannibal propensities.

It may be possible to render the human race immune to the germs of the known micro-parasitic diseases, but the facts given show the high probability that other similar maladies may arise. There may at the present moment be many a lowly innocent organism, nestling it may be in our bodies or hidden in a vertebrate or invertebrate host, or lurking in slime and corruption, that is slowly but surely fitting itself to be a scourge to the human race.

Should such an event happen, modern methods of research would rapidly unravel the life history of the hostile organism, and discover the weak link in its cycle of existence on which to concentrate the attack.

THE INSECT WORLD AND DISEASE.

The part played by insects as active or passive carriers of the seeds of disease has only in quite recent times been appreciated. It is especially those insects that by means of marvellous piercing tools perforate the skin of a mammal, which are the most deadly foes: ticks, lice, bugs, fleas, mosquitoes, and biting flies, all have been shown to be liable to be the host of parasites, a host in which an important part of the life of the parasite is developed, and at a certain stage, the parasite is implanted or inoculated with as much certainty as if from the ordinary subcutaneous syringe. This lends an interest to the study of such insects. An army of workers have elucidated the life-history of all the types, producing a voluminous mass of scientific literature on this subject. The application of such researches is well shown in the case of the anopheles. These mosquitoes, in the larval stage, live in water and breathe by coming just to the surface. Any layer, however thin, of petroleum or other oil-like film, preventing interchange of oxygen kills the little maggots, and Sir Ronald Ross and his co-workers have utilised this fact in reducing the numbers of mosquitoes in affected districts. Obviously this is the stage in which insect life is most susceptible of attack.

It is not alone insects armed with aggressive weapons that are dangerous,

but just as a bee carries pollen from one flower to another, so may the household fly act as a disease distributor.

Researches* have shown that the life of the fly extends to many weeks, and that its powers of flight are considerable, marked flies having been found a mile away within 48 hours; that its capacity of reproducing its species is enormous (a single pair will lay 600 eggs or more); that its breeding place is wherever there is a foul collection of organic matter; and that, outside and inside, a fly abounds in bacteria and fungi.

The *B. tuberculosis* has been found in the fly fourteen days after infection, and it has also been definitely ascertained that any infective matter, even if the fly does not feed on it, adheres to the bristles on the body and legs, and is liable to be brushed off on to food.

The common fly is now believed to have played a great part in the dissemination of typhoid in the South African war and in the American war with Spain, and to be one of the main factors in the spread of infantile diarrhœa in the summer. The campaign against flies is best practically carried out by measures taken against their breeding places; that is to say, in the prompt disposal of animal and vegetable filth.

The rapid decrease of the horse in cities, more economical power being now available by petrol-driven engines, may and probably will there decrease the plague of flies, because their chief breeding place in cities has been stable manure; but, quite irrespective of stable manure, in the country there must always be sufficient other breeding places to render the suppression of the fly difficult. Everywhere, however, it must be quite possible, once the danger is recognised, to protect food from such contamination, and the sickening sight of food black with the house fly in the shop window of an eating-house, or that of a confectioner, will, it is to be hoped, soon be a thing of the past.

Examination of School Children.

Among the direct preventive measures of great utility is the systematic examination of the teeth, throat, and nose of school children; the teeth in decay, the tonsils, and the soft vascular and spongy tissue of the nasal cavity are all the breeding grounds of a host of minute parasites, most of them harmless, but a few quite ready under certain conditions of producing either chronic ill-health, or active septic infections of various kinds.

This examination in not a few of the public schools in our large cities is of great importance, and we may hope to see it extended to all schools.

* The Reduction of Domestic Flies, by Ed. Halford Ross, M.R.C.S.Lond. 1913. House flies and how they spread Disease, by C. G. Hewitt. Cambridge University Press, 1913.

OPEN-AIR SCHOOLS.

Another method of attacking latent maladies in the young is the establishment of open-air schools. It is believed that Germany led the way, and that the first open-air school was established at Charlottenburg in 1905; since then there have been many experiments of the same kind in England, and with uniform success, even although, as in the Marylebone open-air school, the appliances have been of the most primitive description.

In Marylebone, the open-air school has been carried on for two winters, last winter there were sixty children on the register, with an average attendance of fifty; even on the foggiest days thirty attended. The only shelter they had was the band stand; they were mostly anæmic, rickety, tubercular children, but the results were most astonishing, as shown by an increase in weight, in appetite, in general appearance, and in animal spirits.

On a larger scale the two open-air schools of the London County Council gave similar results, and the medical officer has been able to prove the case by researches on the increase of the red blood corpuscles and the increase in weight.

These facts ought to have a great influence on education generally; if it is good for the weakly, pallid, consumptive children to be taught in the open air, why not extend the system to the healthy? Is it necessary to dot town and country with immense brick buildings, built at enormous expense, when simpler structures just sufficient to shelter children from wind and rain on exceptional days would give better results?

In conclusion, this short review of immunity shows clearly that within the past quarter of a century there has been a vast advance in various directions in subjects which have a direct bearing upon public health.

The part played by insects and various other life forms in distributing disease has now, thanks to the biologists, been appreciated. The serum treatment, both as a means of prevention and of cure, is now recognised, and its mechanism more and more understood.

Lastly, the indirect methods of making the body resistant or immune by passing life as much as possible in the open air, at first applied only to invalids, is obviously applicable to the healthy. Open-air education year by year is increasing, and will have a profound influence on the habits of the future generation.

It is not desirable to extend indefinitely human life; but we recognise the desirability of preventing diseases which produce poverty, which make existence unhappy, and which destroy so many persons at their most useful period.

Tuberculosis and Sanatoria Benefit, by ARTHUR LATHAM, M.A., M.D., F.R.C.P.

TO those who realised how much could be done by a properly co-ordinated effort to diminish the suffering and mortality due to the various forms of tuberculosis, the fact that the National Insurance Act made provision for a campaign against this disease gave much encouragement. The fact that the Government of this country, at the instance of the Chancellor of the Exchequer, had recognised the importance of legislating for the protection of the community from this preventable disease, and for the alleviation of those who became affected, gave rise to high hopes that in course of time administrative and other machinery would be evolved, by means of which we might expect in time to diminish the loss and suffering due to tuberculosis, even if we did not succeed in wholly eradicating the disease.

To Mr. Lloyd George must always belong the credit of being the first statesman to recognise how much can be done to improve the national health by a co-ordinated effort throughout the country. We are far, however, from being in the position which at first sight the National Insurance Act seemed to render probable. It is doubtful whether in the past year any real progress has been made in the attack against tuberculosis. Naturally a scheme involving huge questions of administration and so many authorities as are affected by sanatorium benefit cannot be worked out in all its details at once. Sufficient time has, however, elapsed for the broad principles of the attack to be settled. It is the failure of sanatorium benefit to reach even this position which is such a bitter disappointment.

The Astor report contemplated a co-ordinated scheme which had two main aims. From the point of view of the community the aim was to adopt measures which would do much to prevent infection and thus in time eradicate the disease. From the point of view of the individual the aim was to attempt to cure the disease, and where this was impossible to alleviate suffering. Broadly speaking, these aims were to be gained by a scheme of general education of the community, by research, and by the utilisation of dispensaries, hospitals and sanatoria under the guiding influence of specially trained men to be known as tuberculosis officers. The information at my disposal leads me to doubt whether under sanatorium benefit much is being done beyond an attempt, and in many instances a half-hearted attempt, to alleviate suffering and distress. A

scheme such as the Astor report outlined is like a chain, and depends for its strength on every link. If we have no sanatorium beds, the dispensary fails in its primary object, namely, to act as a clearing house. If we have sanatorium beds, but no dispensary where a proper selection of cases can be made, the beds inevitably are utilised for the wrong type of case, and consequently drop out of the scheme. In hardly a single district in England is there any real working scheme on the lines of the Astor report. In London sanatorium benefit is in a position of hopeless muddle. Until quite recently I had under my care at St. George's Hospital a patient waiting for treatment at a sanatorium who applied to the Insurance Committee for assistance in December last. In the middle of June no steps had been taken to help him in spite of repeated applications. His home is unsuitable, and I was compelled to keep him at St. George's Hospital all these months. In another case under my care four months were allowed to elapse before the patient received treatment under the Act. We are told that thousands of patients are receiving treatment at sanatoria. This answer may satisfy politicians who to the man in the street seem to live in an atmosphere of make believe, but it does not satisfy men who know what sanatorium treatment is, and who recognise that an institution such as a hospital in a town cannot be turned into a sanatorium by a mere change of name, or that treatment suitable it may be for advanced cases does not become sanatorium treatment for curable cases simply because it is defined in this way by those who are anxious to stifle criticism.

The meaning of sanatorium benefit has been greatly extended. For example, overcoats, underclothing, food, and fuel have been provided under its regulations. Public health and poor law funds are being relieved, but the sanatorium benefit funds are being depleted, and in consequence the real object of sanatorium benefit, the prevention of the disease, is being severely handicapped. If this use of the available funds did lasting good, criticism might be tempered, but the net result is that sanatorium benefit is mainly Poor Law medical relief under another name, a rechristened form of outdoor relief. The effect of this is to dishearten not only the insured, but those who are willing to help on the great objects of the National Insurance Act. The policy underlying this must do much to hamper any real attempt to carry out the Astor Committee recommendations for years to come.

There are several reasons for this deplorable state of affairs which I hope will be discussed. Among them I would mention the following: Medical officers of health, whose chief experience has been in

administrative questions, have been medical advisers to the committees administering sanatorium benefit, and in too many instances the treatment of patients has been carried out by men of no special experience in the disease, and supervised by administrative and not clinical experts. From the insufficient 1s. 3d. per capita grant for sanatorium benefit 6d. was allocated to the medical man of the insured. The dispensary would cost 4d. or 5d. of the remaining 9d., and only 4d. or 5d. would be left for (1) nursing, (2) drugs, (3) administration, and finally (4) institutional treatment; that is, treatment in sanatoria, hospitals, and homes for the dying. It is not surprising that many committees, and especially those in county boroughs which were beginning to organise on the right lines, suspended work. Another reason, according to my information, is the reactionary attitude of the English Local Government Board, to which abundant reference was made in a recent debate in the House of Commons.

In spite of the present state of affairs I do not despair that gradually some ordered scheme will be evolved. I am encouraged in this view by the results of the post office scheme as especially shown at Benenden. If Mr. Garland and his colleagues were able, chiefly by means of lay workers and on a voluntary basis, to make their scheme such a success, it must surely be possible for the great authorities engaged in sanatorium benefit to win through.

Three things are required. First, the instruction of insurance committees. The Commissioners can do this by organising conferences between members of the various insurance committees and those members of their own staff who have a real knowledge of what is wanted. The insurance committees are anxious to get on, and I feel sure that once they understand what is wanted they can, and will, disseminate information and carry out the necessary work in an orderly sequence. Secondly, there must be an increase in the available funds. Thirdly, no administrative officer should be appointed tuberculosis officer. These posts should be filled by clinicians who have a real knowledge of the disease and its clinical requirements.

[*For Discussion on this paper, see page 379.*]

Administration of Sanatorium Benefit in Towns, by Philip Boobbyer, M.D., M.S., M.R.C.S., Medical Officer of Health, Nottingham (Fellow).

HAVING been invited to open discussions on this subject by both the Incorporated Society of Medical Officers of Health and The Royal Sanitary Institute, and the dates of the two discussions being but a short time apart, I have to a large extent utilized the same MS. for both.

The extraordinary prominence recently given to the subject of tuberculosis and its treatment in the public press, and the animated newspaper discussions of the Insurance Act and its various provisions, including of course sanatorium benefit, have made most people to some extent familiar with the Government scheme for administering the latter. Still, as details are apt to slip from the memory, and as details of the almost statutory requirements of the Government in this regard are obviously important, I shall mention these by way of keeping in mind the standard to which we should work in framing our local schemes to meet the new situation.

The heart of the ideal scheme is the dispensary, which is at once a head office, a clearing house, a diagnosis and treatment centre, an information and an instruction bureau for the entire movement.

The area and population to be served by each dispensary in town districts has been variously stated, but the Local Government Board (Mem. of 14th May, 1912) suggested 150,000 to 200,000 as the population figure for each town dispensary in the immediate future. While centralization in the administrative department necessarily makes alike for economy and efficiency, the fact must not be lost sight of that, even with the best modern means of communication, it is undesirable in a large proportion of cases to call upon the patients to travel long distances. In a town like Nottingham, with a population of 265,000, and a long diameter of more than seven miles, we have started with one central dispensary, but in all probability branch establishments will ultimately be called for.* The experience of schools for mothers and school clinics in this connection all points to such a conclusion.

As regards accommodation and equipment, the appended description

* I may mention here the projected incorporation of the Mothers' and Babies' Welcomes in the dispensary scheme. It is now proposed to use these Welcomes as branch dispensaries, especially for the examination, sorting, and treatment of children suffering, or reputed to be suffering, from tuberculosis, who are resident in the neighbourhood of these institutions.

of what has been found necessary at our own central dispensary will serve as an example of minimum requirements. This dispensary is for the service of the city only. At the outset, in deference to the suggestion of various authoritative reports and memoranda on the subject, the question of union with the county or other outside body or bodies was considered; but the ultimate decision, on the part of practically all persons consulted, and in the interests of all parties concerned, was unfavourable to such amalgamation. It was felt that administrative difficulties would constitute an almost insuperable bar to such union.

The central dispensary building consists of a house of thirteen rooms, utilized as follows:—One room as an office, one as a committee room, one as a waiting room, two as consulting rooms, two as dressing rooms (one each for either sex), one as (drug) dispensary, one as a laboratory and laryngoscopic room. The four remaining rooms may serve for the residential accommodation of one or two nurses and one servant.

The fitting and furnishing of such a house for the purpose of a dispensary as above described, can, with very strict economy, be carried out, in sufficient completeness at any rate to render it reasonably efficient, at a cost of £500, and, according to the Departmental Committee's Report (pages 26 and 27), £400, or four-fifths of this, should be obtainable from the Treasury, leaving £100 only to be provided from the local rates. So much for capital outlay.

The staff consists, or is to consist, of the tuberculosis officer, one assistant, to serve as clerk, dispenser, and occasional bacteriologist, one dispensary nurse, and two visiting nurses. It should be noted that the major part of the bacteriological work required will be done by the city bacteriologist and pathologist, who has a well-equipped laboratory provided by and connected with the health department. This is a brief description in outline of the dispensary as an isolated unit.

Inasmuch, however, as the clinical section of the curative and preventive work must necessarily go hand in hand with public health and housing reform, if the new department is to fulfil itself satisfactorily, it is, to say the least, highly desirable that the dispensary administration should be closely linked up with the health and housing departments. This union or co-ordination should be a matter of definite arrangement from the outset, and there is obviously one official in whose person and office the union should be centred, and that is the medical officer of health.

The tuberculosis dispensary and the sanatorium, to be presently described, are provided by the health department, and in our city, in

order to emphasise the necessity for union between the several municipal agencies operating to improve the public health, and to afford the greatest possible facility for co-operation between the health and housing departments and the new tuberculosis department, the tuberculosis officer has been appointed also the deputy medical officer of health. As the headship of all sections of the health and housing departments is vested in the medical officer of health, this arrangement will enable the tuberculosis officer to deal directly with any health or housing matters requiring attention which may come to his cognizance, through the office of the medical officer of health, including, *inter alia*, such matters as those connected with the supervision of milk and other foods.

A few words now as to the relation of the local Insurance Committee to the scheme. No binding agreement at present exists between the Corporation and the local Insurance Committee, but the latter have practically undertaken to administer sanatorium benefit exclusively by the agency of the local authority, and in pursuance of this undertaking the scheme set out in this paper has been organised.

The tuberculosis officer, appointed and paid by the Corporation and acting as expert adviser to the Insurance Committee, serves as the official personal link between these two bodies.

Owing to the official approval of such an arrangement already given by the Local Government Board, and the obvious advantage of it, so far at least as the majority of our towns and cities are concerned, I shall presume it to be the generally accepted order, and make no reference to possible alternative arrangements of a less convenient character.

No patients from outside the city of Nottingham have hitherto been admitted to the city sanatorium, nor is the admission of such patients at present in contemplation. All available space in the sanatorium is likely to be required in the near future for Nottingham patients. However, several outside authorities have applied for beds.

I proceed to discuss very shortly the routine practice and work of the tuberculosis officer and his staff, but must premise that certain details of work here described, though definitely contemplated, are not yet in operation.

Every case of tuberculosis, or reputed tuberculosis, brought to the notice of the department is visited by one of the outside nurses or inspectors, who takes notes of the following matters: the situation, the size, the rental, and the sanitary condition of the house in which the patient is domiciled; the number of inmates, their ages, sex and relations

to one another, their state of health, present and past, and the amount of money per week earned by the members of the family group to which the patient belongs, or otherwise reaching the family coffers.

The visiting nurses carry with them note-books in which these particulars respecting the houses and persons are entered, and from which they are daily transferred to separate sheets (one for each patient and his family unit) at the dispensary. Any sanitary defect or other kindred matter discovered in the course of these visits is reported to the appropriate department.

If the patient has not a medical attendant, he is at once examined in his own house, or in the dispensary, and a full description of his case entered in the class to which it is held to belong, together with a note of the line of treatment to be adopted, *e.g.*, whether his case be medical or surgical in character, whether domiciliary, dispensary, hospital, or sanatorium treatment is called for.

With regard to observation beds: it was at first intended to establish these at the dispensary, but, in the interests alike of the patients and of the administration, it was ultimately decided to place them at the sanatorium, and this arrangement I have no doubt will be adopted elsewhere whenever the sanatorium is properly equipped and conveniently situated.

Tuberculin treatment, moreover, is now almost exclusively given at the sanatorium, where the patients, of course, are under continual medical supervision. I need not explain the advantage of this arrangement, as compared with home treatment.

If a medical man is in charge of the case, a stereotyped letter is sent to him reminding him of the lines of treatment appropriate to different types of cases which are available under the new régime, and offering the services of the dispensary staff in promoting the efficacy of domiciliary treatment.

Shelters, to be used by patients undergoing dispensary and domiciliary treatment, will be provided by the Corporation under an arrangement with the Insurance Committee, but in towns there must obviously be less scope for the advantageous use of such shelters than in rural areas.

Systematic disinfection of all houses known to contain phthisical patients is carried out by the health department, in all cases where consent can be obtained, as far as possible at regular and frequent intervals.

I may here, perhaps, be allowed to indulge in a brief parenthesis on domiciliary treatment. Owing to the importance this treatment is almost certain to assume under the existing arrangements, by which a pool of

sixpence per head of insured persons is provided for the payment of general practitioners on the local panels undertaking such treatment, I feel constrained to point out, in the first place, that it certainly cannot be undertaken with any advantage to the patients in a large proportion of the working-class dwellings of our modern towns, and in the second, that, even under the most favourable conditions, it will be liable to degenerate into a perfunctory and purely nominal supervision in a large proportion of cases, unless the services of the dispensary staff are requisitioned to see that the patients and their friends understand and put into practice the principles of sound curative and preventive treatment.

Now with regard to sanatoria. The Local Government Board in their memorandum of the 14th May, 1912, tentatively estimated that about one bed per 5,000 of the population would be required for sanatorium accommodation proper, and another like amount for hospital accommodation: this for the guidance of local authorities in endeavouring to estimate the amount of accommodation to be provided under the new régime. The sanatorium at Nottingham, which has been in existence for several years, will serve as the type of a large class of such institutions attached to municipal hospitals in all parts of this country, and may therefore be described as embodying the approximate requirements of towns like our own at the present stage of the anti-tuberculosis crusade.

It consists of one thirty-bed wooden block, two twelve-bed iron blocks, and some large shelters and adapted farm buildings containing about twenty beds altogether. These buildings are furnished with verandahs, and generally equipped for convenient use as open-air hospitals or sanatoria for both sexes. Owing to the character and arrangement of the buildings, it is possible to separate cases of different classes, types, and stages from one another, which is frequently of great advantage. The whole sanatorium stands in open country, apart by itself, but within the general isolation hospital enclosure of twelve-and-a-half acres, at a distance of about three miles northward from the centre of the city. The hospital enclosure has, in its immediate vicinity, a large area of agricultural land belonging to the Corporation, suitable for cultivation by convalescent phthisical patients, and upon which also further sanatorium buildings can be erected. Thirty shillings a week is paid by the Insurance Committee for each patient sent in by that body. Until the 15th July, 1912, when sanatorium benefit under the National Health Insurance Act came into operation, phthisical patients were admitted only on payment of 10s. 6d. a week per head, and, pending the final settlement of the proportional amount of the total cost of providing sanatorium treatment for uninsured persons to be borne by

the Treasury, this arrangement continues for the uninsured desiring to enter the institution. Exercise and employment is provided to some extent upon the agricultural land surrounding the hospital and sanatorium for those in fit condition to work, but the insured patients up to the present have not as a rule proved so industrious as those admitted under the old régime. The insured patients appear to regard themselves as State pensioners on holiday, and to consider all work an evil to be avoided as far as possible. Up to the present, moreover, the Insurance Committee's patients have been sent in only for periods too short to be of permanent advantage to them.

In my first report upon the organisation of the dispensary and sanatorium scheme under the Insurance Act, furnished to the City Council and the Local Government Board in the early part of 1912, I recommended the inclusion of the tuberculosis wards of the general hospital as part of the sanatorium unit for the accommodation of cases requiring active surgical treatment, and in the first instance this suggestion met with a favourable reception at the hands of the hospital authorities, especially in view of the fact that such affiliation was to carry with it a payment of 30s. a week for each patient admitted; but in the end the proposal was rejected on the ground that its acceptance would in some measure involve the sacrifice of the hospital's independence, together with a risk of diminishing its revenue from voluntary contributions. Under existing conditions, therefore, insured and uninsured cases of tuberculosis requiring such surgical treatment as cannot conveniently be given at home or at the dispensary or sanatorium, must be sent to the general hospital, as heretofore, with in-patient letters.

No scheme of this character can be considered complete without a hospital for advanced cases, a farm colony, and an open-air school for tuberculous children; but in most towns at the present juncture, with a demand on the one hand from the Local Government Board for the adequate treatment of insured and uninsured alike, coupled with an offer of half the total cost of dealing with the latter from the Imperial Treasury, and on the other hand a strong desire on the part of local authorities to obtain a larger subsidy than this, if possible, there is an unmistakable tendency to go slow so far as all new developments are concerned, until these authorities know definitely what they can be compelled to do, and how much of the total cost of this huge undertaking they can obtain from the Government.

[*For discussion on this paper, see page 379.*]

Tuberculosis and Sanatorium Benefit, by J. E. SANDILANDS, M.D., Medical Officer of Health, Royal Borough of Kensington (FELLOW).

ABSTRACT.

THE use of the term "sanatorium benefit," to describe the advantages conferred by the Insurance Act upon insured consumptives, has had serious consequences. The disappointment of the incurable consumptives who have been refused admission to a sanatorium is not to be lightly dismissed, when we consider it could have been avoided by the use of some such term as "tuberculosis benefit." But the most serious effects have been due to the pressure of misguided public opinion, which has led to the wholesale admission of consumptives to sanatoria, and left no funds available for other forms of treatment.

The financial aspect of the scheme proposed by the Local Government Board for the prevention and treatment of tuberculosis is particularly unsatisfactory from the point of view of the councils of counties or county boroughs. The proposals in section 17 of the Insurance Act mean that the liabilities of insurance committees are to be strictly limited to the amount of the insurance funds available. Those of the Treasury are limited to the payment of their share of such expenses as they may have previously sanctioned. To the liability of the councils no limit is set. In the first instance they are invited to share with the Treasury the difference between the estimated cost of treating all consumptives and the amount available in the insurance funds for the treatment of the insured; but for all expenditure in excess of the estimated amount the councils are to be alone responsible. To a needy insurance committee a direct inducement is thus offered to press for the admission to sanatoria of insured persons, whose maintenance will be paid for by the rates as soon as the insurance funds are exhausted, whilst the credit for their treatment will continue to go to the authors of the Insurance Act.

At the outset, when the sum of 1s. 3d. had been set aside, without any substantial deductions, for the treatment of patients in sanatoria and at tuberculosis dispensaries, the scheme was given some chance of paying its way without being bolstered up by money from the local rates. Now the amount available for such treatment has been reduced to 9d., and the greater part of the remaining 6d. is to be set aside annually to meet the initial cost of breaking the strike of the doctors. Nominally the amount deducted is to pay for the domiciliary treatment of consumption: in practice it will be used to supplement the pay of the panel doctor for the treatment of illness of any kind among insured persons.

In a number of circulars the Government have advocated tuberculosis dispensaries and make no mention of domiciliary treatment as an important part of their scheme. As a result tuberculosis dispensaries have been established, and the number of insured consumptives whose condition will necessitate home treatment will be exceedingly small, and yet more than one-third of the funds available have been set aside for this form of treatment which involves neither the cost of maintenance nor the cost of lodging.

It is true that under the new conditions the opposition of general practitioners to tuberculosis dispensaries has been withdrawn, but only at a price which has reduced the funds for sanatorium benefit to a state of bankruptcy.

For this state of affairs the addition of another sixpence to the funds is the only remedy, and until this remedy is applied, county councils which undertake schemes are likely to find at the end of the financial year that considerable sums from the local rates have been used for the treatment of persons who should have been paid for out of insurance funds. At the same time, the statutory health authority, with its wide purview of the conditions in the home, the workshop, and on the dairy farm which affect tuberculosis, is clearly the proper authority to take charge of preventive measures, in which treatment must be included.

The whole ground cannot be covered in a comprehensive fashion by insurance committees or tuberculosis dispensaries, and under amended financial conditions counties and county boroughs will no doubt take up in their respective areas the position of supreme tuberculosis authorities, which section 17 of the Insurance Act clearly intends them to occupy.

[*For discussion on this paper, see page 379.*]

The Problem of Sanatorium Benefit in a Home County, from a Tuberculosis Officer's point of view, by JAMES MACFIE, M.B., Ch.B., Tuberculosis Officer to the Essex County Council.

ABSTRACT.

FEW of the counties can have offered such a difficult problem as that of Essex. Its relationship to London, its large agricultural districts, its rapidly-growing seaside resorts all tend to increase the difficulties of organising the effective working of so far-reaching an innovation as that of sanatorium benefit. The administration of such a scheme requires, especially at the beginning, a born organiser at its head, and, at any rate

at first, the work ought to be centralised. For this reason a county council is the right body to have control until the main details of the scheme have been got into working order. After the county councils have worked out their own salvation, a more stereotyped scheme will be adopted, based on the experiences and mistakes of the several units.

The population of Essex is 1,100,000, the metropolitan divisions accounting for 500,000. The chief towns outside the metropolitan area are: Chelmsford 18,500, Colchester 43,500, Southend-on-Sea 71,000, Clacton-on-Sea 10,000, Grays 16,000, Harwich 13,623, and Maldon 6,253. It will be seen, that as the acreage of the metropolitan area is 23,000 acres, the population is 48 to the acre in that area as compared with 6·6 in the extra metropolitan divisions. In his original report, Dr. Thresh, the county medical officer of health, divided the administrative county into nine areas, with one whole-time tuberculosis officer to each area, and to make a beginning three tuberculosis officers were appointed, and started work on the 25th of September, 1912. One officer had charge of the metropolitan area, and the rest of the county was divided into two. Three dispensaries were started in the metropolitan area, one in the western part, and three in the eastern part. It is hard to choose a place suitable for a dispensary. It should be central and yet in a quiet position. It ought not to cost much more than £70 to equip. The function of such a dispensary is all important, it is the hub of the tuberculosis wheel. The dispensary ought to be so organised that ample time can be given to every case, as the importance of the early detection of phthisis is all important, and thus it will be seen that its head must be a man of experience. Quality, not quantity, of work ought to be aimed at.

The work in Essex was found to be too much for three officers, and so in May, 1913, three other officers were appointed. We have at present eleven dispensaries. Attached to the dispensaries there ought to be nurses; whether the nurses ought to be whole-time ones or part-time ones must depend on the amount of work. Inconvenience to the patients and their families is of importance. If a whole-time nurse is employed, in a very short time she becomes known, with the inevitable result that her visits are noticed by the neighbours; this ought to be avoided. If a school nurse is employed the risk of carrying infection must be borne in mind, both from and to the consumptive. District nurses might be employed, but in many areas the district nurse is debarred from visiting infectious cases; the question must be settled by the local authorities. Overlapping must be avoided. At the beginning of the consumptive crusade this overlapping has been too apparent, and time alone will get the working

machine into proper order. Complete co-operation between the district medical officer of health and the tuberculosis department of the county council is essential. The tuberculosis officer ought to have complete charge of all the tuberculosis in his area, know such cases personally, and advise as to what should be done with them.

Compulsory segregation of infectious cases will in time no doubt be made legal. The question of extra diet and help to the poor consumptive can only be properly grappled with by personally visiting the patient and in consultation with the general practitioner. Food is more important in a wasting disease than almost anything else except fresh air. Without these two all the drugs in the pharmacopœia are of no avail, and tuberculin is useless. In Essex we have in each big town a recognised dairy and butcher to supply our patients with the extra diet. Drugs are kept in small quantities in the dispensary, and a prescription is written for any other drug. Unscientific as it may seem to those of us who have principally worked in institutions, a bottle of medicine has the greatest moral effect on the patient. Fresh air must be prescribed for every patient, and this probably is the most difficult thing to get the patient to take. A Bill making it compulsory to keep the windows open at the top, if feasible, would be of the greatest preventive value to the nation. It is surprising to think that if there is anything in the theory of ventilation it should be treated with such universal contempt.

With regard to the work done in Essex, I only speak of the area I have had charge of. We use a classification with six headings. Of the first 100 cases recommended for sanatorium benefit, 7 non-pulmonary cases do not come under the classification, leaving 93 cases decided as follows: Group i., 2; Group ii., 16; Group iii., 21; Group iv., 26; Group v., 23; Group vi., 5; showing how advanced the cases are before they come under observation. The age-incidence of the 100 cases was as follows: 10–20 years, 26; 21–30 years, 39; 31–40 years, 20; 41–50 years, 11; 51–60 years, 2; and 61–70 years, 2. There were 68 males and 32 females. There was no marked difference in the stage of the disease between the sexes; 42 were indoor workers, 18 outdoor workers, and 8 were boys. Various usual complications were found; 22 were rural cases, 78 urban cases. The problem of sanatorium benefit in strictly rural districts is a very difficult one: 2,502 miles were travelled to see the first 100 cases. Unfortunately we have no county sanatorium, so we have had to hire beds in existing sanatoria. We have at present 50 beds in sanatoria and 60 in isolation hospitals. The question of placing consumptives in isolation hospitals is a very serious one, but already it has

been proved that the risk of a crossed infection is remote, and depends almost entirely on the administration of these hospitals. Sanatorium treatment was recommended for 16 patients, hospital treatment for 8, dispensary treatment for 28, and domiciliary treatment for the rest.

The question of the early case and the examination of contacts is one of paramount importance. In Southend the medical officer of health sends me all the notifications in the borough. I then communicate with the patient's doctor, and see and examine the case with him, filling up a form giving the usual particulars. By these means every case in the borough comes under my observation, and any help that I can give is willingly offered. Any contact who has suspicious signs of tuberculosis is examined and dealt with, the patient is advised as to the disposal of sputum, etc., and the consultation is of great value. The tuberculosis officer ought to be the one to seek out tuberculosis cases as well as to treat them at his dispensary. The treatment of tuberculosis must not be taken away from the general practitioner, as his intimate knowledge of the family is of great value; his help in the crusade ought to be cordially invited, and he ought to look upon the tuberculosis officer as a man who has specialised in this department, and who is able to be of help. Tuberculin treatment must be learnt by the general practitioner, and the man on the spot, namely, the tuberculosis officer, could at the beginning show him how to select suitable cases and advise as to dosage, and, if needs be, make up the dilutions. The large number of tuberculins on the market, the number of methods of giving it, the different dose nomenclature employed all tend to frighten and befog a man, and then he is timorous of starting the treatment; if he has someone to help him there should be no difficulty. The dogmatic utterances of the tuberculin faddists are doing great damage to the treatment of tuberculosis. The domiciliary visitation and examination of every notified case is the only way of dealing effectively with tuberculosis. The general practitioner is always welcome at the dispensary, and too much stress cannot be laid on the fact that he is the mainspring of sanatorium benefit.

[*For discussion on this paper, see page 379.*]

The Prevention of Human Tuberculosis of Bovine Origin (particularly from the point of view of the Tuberculosis Order, 1913), by WILLIAM G. SAVAGE, M.D., County Medical Officer of Health, Somerset.

THIS problem involves three considerations:—(1) The extent to which human tuberculosis is of bovine origin; (2) The prevention of human infection from bovine sources; (3) The diminution of bovine tuberculosis.

As regards the relationship of bovine to human tuberculosis, and the intercommunicability of the two types, I do not propose to make any extended remarks. Every person who has read the careful experiments and deductions of the last English Royal Tuberculosis Commission, backed up and confirmed as they are by numerous experiments carried out in other parts of the world, can have no doubt of the relationship, although there is still room for discussion as to the *amount* of human tuberculosis of bovine origin.

We may accept the words of the Royal Commission:—

> "There can be no doubt but that in a certain number of cases the tuberculosis occurring in the human subject, especially in children, is the direct result of the introduction into the human body of the bacillus of bovine tuberculosis; and there can also be no doubt that, in the majority at least of these cases, the bacillus is introduced through cows' milk. Cows' milk containing bovine tubercle bacilli is clearly a cause of tuberculosis, and of fatal tuberculosis, in man."

We are not yet in a position to definitely state the proportion of human tuberculosis of bovine origin, although data are steadily accumulating. In my opinion, the most reliable estimate is that based upon the determination in human cases of the types of tubercle bacilli present.

Park and Krumwiede, in a series of valuable papers, give their own findings and the results of a number of other groups of investigators, as regards the presence of human and bovine tubercle bacilli in human cases of tuberculosis. Their results are shown in Table I.

Apart from exceptional circumstances, bovine infection to man is spread entirely from tuberculous meat and milk, including milk products. Of these, milk, and to a less extent butter, is by far the most important, and must be regarded as the main vehicle of infection.

Considering milk alone, the second consideration resolves itself into, How far can human infection be prevented from tuberculous milk?

Roughly speaking, not less than 10 per cent. of ordinary milk samples contain tubercle bacilli in an active virulent condition (to the guinea-pig).

In milks sent to Sheffield, for example, examined in 1911, the percentage was 9·8; in London for the same year 10·8 per cent.

These bacilli are derived from cows suffering from tuberculosis; but, as

TABLE I.—*Combined Tabulation, Cases reported including their own series of Cases.*

Diagnosis.	Adults 16 years and over.		Children 5 to 16 years.		Children under 5 years.	
	Human.	Bovine.	Human.	Bovine.	Human.	Bovine.
Pulmonary tuberculosis	644	1 (?)	11	...	23	1
Tuberculous adenitis. Axillary or Inguinal	2	...	4	...	2	...
Tuberculous adenitis cervical	27	1	36	21	15	21
Abdominal tuberculosis	14	4	8	7	9	13
Generalised tuberculosis. Alimentary origin	6	1	2	3	13	12
Generalised tuberculosis	29	...	4	1	43	5
Generalised tuberculosis; including meninges. Alimentary origin	...	...	1	...	3	8
Generalised tuberculosis; including meninges	5	...	7	...	52	1
Tubercular meningitis	1	...	3	...	27	4
Tuberculosis of bones and joints	27	1	38	3	26	...
Genito-urinary tuberculosis	17	1	2	...	...	...
Tuberculosis of skin	3	...	1	...	1	...
Miscellaneous Cases.						
Tuberculosis of tonsils	...	...	...	1	...	...
Tuberculosis of mouth and cervical nodes	...	1	...	...	...	...
Tuberculous sinus or abscesses	2	...	...	...	...	...
Sepsis, latent bacilli	...	...	...	...	1	...
Totals	777	10	117	36	215	65

Mixed or double infections, 4 cases.
Total cases = 1,224.

From this table they obtain the following, showing the percentage incidence of bovine infection:—

TABLE II.—*Percentage Incidence of Bovine Infection.**

Diagnosis.	Adults 16 years & over.	Children 5 to 16 years.	Children under 5 years.
Pulmonary tuberculosis	0	0	4·1
Tuberculous adenitis, cervical	3·6	3·6	5·8
Abdominal tuberculosis	2·2	4·6	5·9
Generalised tuberculosis	2·7	4·0	2·3
Tubercular meningitis (with or without generalised lesions)	0	0	13·6
Tuberculosis of bones and joints	3·5	7·3	0

* For further comparative data, see the writer's "Milk and the Public Health." 1912. Macmillan & Co.

is well known, not all tuberculous cows excrete tubercle bacilli, but only those which are "open" cases of tuberculosis. For practical purposes such cows comprise three groups: (*a*) advanced cases of tuberculosis; (*b*) cows suffering from tuberculosis of the udder; (*c*) cows suffering from "open" tuberculosis apart from (*a*) and (*b*).

Undoubtedly group (*b*) is the most important source of tubercle bacilli to milk, while group (*c*) furnishes the smallest number of tubercle bacilli.

The administrative procedure for dealing with these animals is contained in the Tuberculosis Order, 1913, of the Board of Agriculture, which came into force May 1st last. It is important to consider the extent to which this very important Order is likely to eliminate altogether or to diminish the presence of tubercle bacilli in milk.

In the words of the covering Circular of the Board, the Order "aims at securing the destruction of every cow found to be suffering from tuberculosis of the udder, or to be giving tuberculous milk, as well as of all bovine animals which are suffering from tuberculosis with emaciation."

To detect these animals, two lines of procedure were available. On the one hand local authorities might have been required to arrange for systematic inspection of the cows and bovine animals in the area under their jurisdiction, with the view of finding the above classes of tuberculous animals; or, on the other hand, all owners of such animals might be required to notify them to the local authority. The second procedure has been adopted, and it is now the duty of those owning such animals to give information of the fact to an officer of the local authority without avoidable delay.

In the practical working of this Order certain criticisms and questions suggest themselves, of which the most important is the extent to which it is likely to result in an elimination of tubercle bacilli from milk. It is clear that only a diminution of the percentage of tuberculous milk, and not a total elimination, is to be looked for.

In the first place, both as regards cows suffering from tuberculosis with emaciation ("wasters") and cows suffering from udder tuberculosis, particularly the latter, it will, I believe, inevitably result that, in at least many cases, there will be a long delay, possibly of many months' duration, between the time these cows become active distributors of tubercle bacilli into milk and their detection by the veterinary inspector of the local authority. During this period not only will tubercle bacilli be added to the milk, but these highly dangerous animals will have abundant opportunities of infecting other cows in the herd.

Again, not only will detection be frequently late in the course of the

disease, but in the case of tuberculosis of the udder a number of cases will be overlooked and missed. The published opinions of expert veterinary authorities clearly show that even with competent and skilful veterinary surgeons the diagnosis of early tuberculosis of the udder may be a very difficult matter. This point is so important that a few authorities may be quoted in support of it. For example, Dewar* says—

> "In the udder the progress of the disease is often slow, and there is no doubt but that it may exist for weeks in such a condition as to render the milk dangerous before the most expert clinician could detect its presence."

Nocard† remarked that the diagnosis of tuberculosis mammitis is

> "both urgent and difficult; the clinical symptoms are vague, and generally point to a range of probabilities which are more or less certain. Even if the cow has reacted to tuberculin, it does not necessarily follow that the induration of its udder is tuberculous, for tuberculous cows, as well as healthy ones, are liable to contract mammitis of various natures."

Professor Delépine, who has had great experience in this problem, remarks‡

> "Tuberculosis of the udder can be detected with great accuracy by a combination of veterinary inspection of the cows and of bacteriological examination of milk obtained from udders showing signs of disease, more especially enlargement and induration. It is, unfortunately, impossible for the most experienced veterinary surgeon to distinguish by inspection and palpation, tuberculosis mastitis from all other forms of mastitis. It is also practically impossible for the veterinary surgeon, unaided, to discover by ordinary inspection early tuberculous lesions of the udder."

Delépine, indeed, found in his work at Manchester, and working with highly experienced veterinary inspectors, that not more than one third of the udders which on inspection appeared to be possibly affected with tuberculosis were on bacteriological examination proved to be actually tuberculous. The Sheffield results afford evidence in the same direction.

Finally, the discrepancy between clinical and post mortem results may be mentioned. As an example, the following data from a report of Dr. Wilson,§ county medical officer of health, Lanark, may be quoted. He found that out of 42,024 cows examined in four years by experienced veterinary surgeons only ·08 per cent. showed udder tuberculosis. In contradistinction to this, at the Bellshill Public Slaughter-house, where careful records were kept, the number of cows found to have had udder tuberculosis was about 2·6 per cent. He concludes, as regards udder

---

* Transactions, British Congress on Tuberculosis, 1901, Vol. IV., p. 3.

† Ibid, p. 8.

‡ Report of the Medical Officer of the Local Government Board, 1909, p. 412.

§ County Medical Officer of Health's Report (17th), p. 23.

tuberculosis, that "at present we may assume that less than one-thirtieth of the actual number can be detected."

While certainty in the diagnosis of udder tuberculosis cannot be attained by clinical examination alone, many if not most of the difficulties can be removed by the use of combined clinical and bacteriological examinations. The Tuberculosis Order contemplates the use of such combined examinations; and the Board of Agriculture, in their Circular of March 25th, 1913, directs local authorities to

> "issue instructions to their veterinary inspectors that in the case of cows suspected of having tuberculosis of the udder or giving tuberculous milk; samples of their milk should be centrifugalised and examined for tubercle bacilli with the microscope."

It may be mentioned in passing that while simple microscopic examination is usually sufficient to detect tubercle bacilli in milk samples from individual cows, it is not only quite unreliable for mixed milk samples, but in a certain proportion of single cow samples the bacilli will fail to be detected, particularly if the sample is badly collected.

Summing up the matter as regards tubercle bacilli in milk, it is evident that if the Order is properly and vigorously put into force, there will be a considerable and very valuable reduction in the amount of tubercle bacilli in milk, but very far from a complete elimination of tuberculous milk. Tubercle bacilli will still gain access to milk from the following sources: (*a*) "wasters" and udder tuberculosis cases not yet reported and slaughtered; (*b*) missed cases of cows suffering from udder tuberculosis; (*c*) cows with other varieties of "open" tuberculosis neither reported nor detected.

The benefit is very considerable, but the compensation to be paid is very heavy, and, in my opinion, can only be justified if it is largely a non-recurrent expenditure, or at least one which will very largely diminish within a few years. While everyone admits that the expenses in the first few years will be very heavy and out of proportion to the normal expenditure, it is usually advanced that after a few years there will be a great diminution of the compensation to be paid, due to a diminution in bovine tuberculosis generally, and particularly in the varieties of tuberculosis which have to be notified.

It is clear that the prevention of human tuberculosis of bovine origin cannot be separated from the prevention of tuberculosis amongst bovine animals, and that no steps can be permanently satisfactory unless they definitely aim at a diminution of the total bulk of bovine tuberculosis. I am not sanguine that the present Tuberculosis Order, as it is likely to be put into operation in the different areas, is likely to largely diminish the amount of bovine tuberculosis.

It has been shown above that at least the great majority of cases of udder tuberculosis and "wasters" will not be detected and slaughtered until *after* they have been actively excreting tubercle bacilli for long periods and have had abundant opportunities of infecting other cows in the herd. When the other cows have been exposed to extensive and continuous infection, and a considerable proportion has become infected, the local authority steps in and removes the active centre of infection.

It is much worse than trying to prevent the spread of human tuberculosis solely by the removal of advanced human cases, since the latter can be taught to control their expectoration, while cows are especially sensitive to infection. Also the grossly insanitary condition of many cowsheds greatly favours infection.

The powers are similar to those of the Model Clauses, and where these have been in operation and these cows have been weeded out, no percentage diminution of udder tuberculosis has been noticeable. This is shown by the following table:—

Year.	MANCHESTER.	SHEFFIELD.	
	Percentage of outside cows found with udder tuberculosis.	Percentage of country cows with udder tuberculosis.	Percentage of city cows with udder tuberculosis.
1901	1·4	—	0·47
1902	2·5	2·7	0·31
1903	1·1	0·96	0·45
1904	0·6	0·59	0·45
1905	0·9	3·9	0·26
1906	1·05	0·6	0·14
1907	1·1	1·9	0·8
1908	0·9	2·6	0·9
1909	1·03	4·0	1·1
1910	—	3·8	0·6
1911	—	3·5	0·7

Apart from the slaughter of the specific groups of tuberculous animals, the preventive work in the Order is not extensive. Under Article 4 of the Order, as the first circular of the Board remarks,

> "the veterinary inspector will be able to extend his examination to any bovine animals upon the premises that have been associated with a diseased animal, in order that he may at the same time take steps to deal with any other bovine animal which in his opinion presents clinical symptoms of tuberculosis."

In their March 25th circular they repeat this advice, and say the examination should be extended to other bovine animals on the premises, and particularly to all milch cows.

The Order itself, section 4 (1) states that any veterinary examinations to be made are such "as in the opinion of the local authority is necessary." Any preventive work of this nature clearly, therefore, rests with the local authority, and the more active they are the greater the compensation they will have to pay for the first two years.

So far as I have been able to ascertain, most local authorities are looking at the problem from the purely financial standpoint, at any rate in the rural districts.

To work the Order on the best preventive lines, it would be necessary to provide a staff of whole-time veterinary inspectors, who would make it their business to thoroughly examine all herds the milk from which showed the presence of tubercle bacilli, or from which a notification had been received.

It is, as yet, too early to say what will be done in the different counties, but I believe it will be found that in the majority of cases the Order will be worked with a minimum of expense through the local veterinary inspectors now employed in connection with the diagnosis of disease under the Diseases of Animals Acts, and that active preventive work will not be encouraged. This, of course, is a very short-sighted policy, and will largely result in perpetuating the compensation to be paid.

If this forecast is unfortunately realised, I think we must not accept this Order by itself as likely to play any great part in the diminution of bovine tuberculosis in the bulk, and therefore as being most inadequate and inadequate in itself. I rather look upon this Order as a first instalment, and possibly goes as far as it is now wise to go, but is incomplete in itself, and must be followed by an extended use of true preventive measures.

These preventive measures must include active educational propaganda, not only to explain to farmers the nature and lines of prevention of tuberculosis in cattle, but also to educate the public to an appreciation of milk free from tubercle bacilli, and should be developed on the lines of assisting the farmer to rear a tuberculosis-free herd.

[*For discussion on this paper, see next page.*]

[*This discussion applies also to the papers by* DR. LATHAM *(p. 358)*, DR. BOOBBYER *(p. 361)*, DR. SANDILANDS *(p. 367)*, *and* DR. MACFIE *(p. 368)*.

MR. RUSSELL COOMBE (Exeter) wished to emphasise that the treatment of tuberculosis was both medical and surgical. His friend, Dr. Latham, had spoken of the present campaign as an attack on consumption, but he wished to draw special attention to the distinction to be made between the "open," or infectious cases, which were mainly lung cases, and the "closed," or non-infectious, which were mostly gland and joint cases. In the Insurance Act there was a distinct failure to recognise closed, or surgical tuberculosis, as distinguished from open, or consumptive cases, and even on the Astor Committee not a single consulting surgeon had found a place.

He hoped that not only the politicians and members of insurance committees mentioned by Dr. Latham, but also members of County Councils would soon become educated to the importance of surgical tuberculosis cases. He quoted Dr. Pritchard as stating that "tuberculosis in children is essentially a disease of the lymphatic system," and gave as an example the fact that tuberculous abdominal glands were found in 88 per cent. of children dying from tubercular disease. He laid especial stress on the fact that these patients by the nature of the case had shown their vulnerability, and so far from its being deemed justifiable to expose them to fresh infection by proximity to "open" cases, they were, of all classes of the community, those which should be considered to require most protection from the risk of further infection.

DR. E. WALFORD (Cardiff) said the position in Wales differed from that in England in some respects. In Wales they had less of the Local Government Board and more of the Insurance Commissioners than in England. The distribution of grants in aid to sanatoria and other institutions was in the hands of the Commissioners, and it was provided in the Insurance Act that the Commissioners in making these grants must have regard to the provision of such institutions by any association established for Wales by Royal Charter.

The essential difference between the English and Welsh methods of administering sanatorium benefit, and of treating tuberculosis generally, was that in England the councils of counties and county boroughs had, for the most part, followed the advice given by the Local Government Board and Departmental Committee, to the effect that "the organisation of schemes throughout the country can best be carried out if undertaken by local authorities," and that the "councils of counties and county boroughs, or combinations of these bodies, should formulate complete schemes, even though parts of such schemes may in some instances be carried out by voluntary agencies." It was intended in England that the complete control of the entire scheme for each county, or

county borough area, or group of areas should be in the hands of the councils of those areas, and very properly so. The Local Government Board stated definitely that "the organisation of schemes must be undertaken as part of the public health administration of the area to which they relate, and the medical officer of health should be the chief executive and organising officer." Where voluntary agencies gave their help they gave it to the councils of counties and county boroughs, who paid the agencies for work done. The Insurance Committees also made arrangements for the treatment of the insured and their dependents directly with those councils, who therefore kept control of the whole machinery.

In Wales the Insurance Commissioners had practically insisted upon the Insurance Committees making arrangements for treatment directly with the Memorial Association, and upon the councils contributing out of the rates to a common fund, all to be placed at the disposal of the Association, who also received directly all Treasury grants through the Welsh Commissioners. By that arrangement the councils of counties and county boroughs were relieved of all responsibility except that of providing enough money to keep the Association going.

The Insurance Act, Sec. 64 (3), provided for the combination of county councils, county borough councils, and other local authorities by the formation of statutory joint committees, with suitable administrative powers, for the purpose of facilitating co-operation. If it was considered desirable to unite thirteen counties and four county boroughs into one body, surely it would be better to unite them by means of a properly constituted statutory committee, with which the several insurance committees could make arrangements for the treatment of the insured and their dependents. The joint committee could then make arrangements with the Memorial Association for carrying on such part of the work as was thought desirable. The national basis of the scheme would *still* remain; it would, in fact, be on a firmer basis than at present, but the councils would be in their proper position and responsible for the scheme, and after all these councils were more truly representative of the nation than a voluntary association.

It was, of course, most essential that the tuberculosis officer of the Association should work in complete harmony with the medical officer of health, as the connection of the dispensary with public health work was necessarily close and intimate. In the district with which he was connected, the city of Cardiff, there was every probability of that harmony being complete.

He was strongly of opinion that, in large towns at any rate, the medical officer of health should not undertake the treatment of patients. He had plenty of other things to do in connection with the prevention of disease, and should leave the cure or medical treatment to those who were constantly engaged in the practice of curative medicine. He should, however, be respon-

sible to his council for the proper administration and organisation of the dispensary and correlated public health work.

The Departmental Committee were right in stating that the bodies legally responsible for the establishment and maintenance of the tuberculosis dispensary should be the councils, and that those bodies should occupy an important position in any general scheme dealing with tuberculosis. The Local Government Board even advised that in many cases it might be desirable for the tuberculosis officer to act as an officer of the sanitary authority, and to carry out under the medical officer of health some of the duties devolving upon that officer under the tuberculosis regulations.

DR. WILLIAM J. HOWARTH (City of London) thought that the discussion had, so far, taken a pessimistic tone, although generally medical officers of health were optimistic in the highest degree. Criticism of the financial aspects of the situation had been advanced, and he had to confess that he first framed his scheme with the idea that the available contributions would pay not only for the insured persons, but also for dependents. That was not so; dependents were to be provided for by county councils and others, and in return the State was going to pay half the excess of expenditure, after deduction from the gross of the contribution of the insurance committees. This contribution did not appear to be in excess of what the cost of treating the dependents would be. The county councils ought not to be involved in further contributions, further money should come from the State; otherwise no money would be available for preventive measures, which were just as important as the present proposals, and without which failure would result.

He also directed attention to the danger of giving utterance to an exaggerated estimate of the results. He was not prepared to promise that consumption would be eradicated in five or fifty years, or, for that matter, in any number of years.

MR. JAMES A. DIXON (Leeds) emphasized Dr. Savage's statement that the Tuberculosis Order of 1913 must not be expected to reduce very greatly the prevalence of tuberculosis in milk. The Order was faulty in its provisions by depending on notification, and it was not being effectively administered by many county councils. In his opinion, founded on experience of the tuberculin test, on which he still relied, 70 per cent. of dairy cows were tuberculous.

No real progress would be made in the elimination of tuberculosis from cattle until county councils appointed enthusiastic whole-time veterinary inspectors who were free from the embarrassment of troublesome clients.

DR. H. KERR (Newcastle-upon-Tyne) said he emphatically disagreed with Dr. Latham's pessimistic view. In Newcastle they had already treated upwards

of 300 cases, and had a very complete scheme in a fair way of activity. But they were met with a great difficulty in which the experience of other towns would be useful. In their endeavour to obtain premises for a tuberculosis dispensary, strong opposition had been raised to each house considered, on the ground that (1) the value of surrounding property had been depreciated; (2) an infected area would be established.

Dr. Anderson (Doncaster) described Dr. Latham's paper as one which was too critical and fault-finding. His experience was that excellent work was being done through the Act.

Alderman Shelmerdine (Liverpool) said the Liverpool Corporation adopted the principle of electric sterilization in their children's milk depots. This method could be readily adopted for the milk supply of every town and city in the country. Such sterilisation would have undoubtedly an important effect not only upon tubercle in milk, but also on diseases such as scarlet fever, typhoid, and diphtheria, which were undoubtedly caused by manurial contamination. One of the principal sources of disease would thus be annihilated entirely.

Dr. Mabyn Read (Worcester) stated that he had been working the sanatorium benefit in the city of Worcester since September, 1912. The tuberculosis dispensary was opened in temporary premises; twenty beds in detached blocks of the isolation hospital, which was well situated for the purpose, were provided, also a nurse was obtained who visited the homes of the persons notified. He looked for good help on the preventive side from the spread of information among the friends of the persons treated. But the general public needed educating as to what the risks were which were run by those who were in close contact with consumptives. Great hardships were likely to fall on those persons, unless their fellow-workers and friends understood that a consumptive who carried out the lessons he had been taught in a sanatorium was not dangerous in the workshop nor in the home.

Dr. J. Coote Hibbert (Blackburn) urged that as shortage of funds was the chief difficulty of the present time in providing satisfactory treatment for tuberculosis, it was very important that the best be done with the money available, and that this could only happen if the preventive side of the work received full attention. With that object in view, it was essential, so far as institutional treatment was concerned, to deal first with those advanced cases which would be a danger to others if left at home; and the greatest use should be made of existing institutions, such as the fever and smallpox hospitals, which could be easily extended if necessary at comparatively small cost, for as a rule the extra administrative expenses were slight.

In many districts the hospital was well situated, and could be used not only for the treatment and isolation of advanced cases, but also for the efficient treatment of early cases with a view to a cure of the disease, and to that he could speak from personal experience.

He summarised many advantages in making use of a local hospital besides that of economy: 1. Convenient situation as regards easy removal of patient and within short distance for visitors; 2. The patients were treated under the same climatic conditions as those under which they would probably have to resume work; 3. The patients could attend to any matter of urgency at their own homes during their period of institutional treatment; 4. The discharged patient was more likely to attempt to carry out at home the mode of living he had learnt in a small institution than if treated in a large, elaborate sanatorium; 5. A small sanatorium in each district was an educational factor of importance; 6. The patients on discharge would be under the same tuberculosis officer at the dispensary as when in the local sanatorium; 7. If only advanced cases were treated locally, the local treatment would necessarily obtain a bad reputation.

He agreed with Dr. Savage as to the need for dealing more effectually with the milk supplies, and instanced the fact that he had found during the last three years 7 to 20 per cent. of the supplies of a Lancashire borough to contain tubercle bacilli.

MR. PAUL SWAIN (Plymouth) feared that people were acting in a panic. They had just found out that there was such a thing as tuberculosis. They should remember that in the last decade, owing to improved sanitation, the deaths from tubercular disease had considerably diminished. He commented on the bad results of sanatorium treatment, and advocated the providing sanatoria in close proximity to the people for whom they were provided.

DR. W. C. HOSSACK (Calcutta) referred to Dr. Dixon's statement that 70 per cent. of milk cows were tubercular, as proved by the tuberculin test. The natural presumption was that in view of this alarming fact, no effort and no expense should be spared to eradicate bovine tuberculosis, and the further presumption followed that the more bovine tuberculosis was reduced proportionate should be the reduction in human tuberculosis. Was this last presumption justified in view of the facts as to tuberculosis in Calcutta. There, bovine tubercle was rare, a statement made on the authority of two successive chief veterinary officers in Bengal. In addition, what small risk there was, was reduced to a negligible minimum by the circumstances and habits of the people. Bottle-feeding among the lower orders was practically unknown, milk for many being an unprocurable luxury, and where milk was used it was almost invariably boiled, or fermented as "dhai," the Bengal equivalent of Bulgarian milk. Nevertheless, human pulmonary tuberculosis was rampant, accounting for approximately six deaths per mille per annum, or a fraction varying from about

one-fifth to about one-sixth of the total mortality. Those were facts that should be borne in mind by those who advocated enormous expenditure in eradicating bovine tuberculosis in the hope that human tuberculosis would be abolished. It was notable that bone and gland tubercle in man were comparatively rare in Calcutta.

Dr. T. W. N. Barlow (Wallasey) strongly dissented from Dr. Latham's views in several particulars. The latter was disappointed that there were so few new sanatoria. Did he expect sanatoria to grow like mushrooms? These institutions took time to provide, and not a little of the delay was due to the Local Government Board's tardiness in approving many of the plans. Dr. Latham objected to existing hospital buildings being used for the treatment of tuberculous patients, and being called "sanatoria." The speaker said that there was nothing sacred in the name "sanatorium." A sanatorium was merely an institution where people lived under perfect hygienic conditions and medical supervision. There was no good to be obtained from any sanatorium which could not just as easily be obtained in any decent house with a garden in any town, provided that the patient did as he was bidden by his medical attendant, and other conditions with respect to food, clothing, etc., were satisfactory.

There was a lot of nonsense talked about sanatoria and so-called fresh air. All the fresh air necessary for the treatment of phthisis could be obtained in any but the very largest of our large towns, and even in the suburbs of those.

Too much stress had been laid on the curative side of this question. No disease had yet been stamped out by curing those affected with it, *e.g.*, typhus had not been eradicated from our midst by curing those suffering from it, but by improved housing and general sanitary environment. We must, moreover, educate the people rationally, and not lay too great stress on the infectivity of phthisis; by so doing, we made it hard for those suffering. The prevention of phthisis was not a purely medical question. It was largely a social question, and the disease would be stamped out largely by social and housing improvements, and not by the building of sanatoria. So long as poverty existed, so long would phthisis be found.

Pollution of Shellfish, from an administrative point of view, by T. Dunlop, M.B., D.P.H., Medical Officer of Health, Torquay.

THE question of the disposal and consumption of shellfish taken from polluted sources is one of considerable interest to all engaged in public health administration, and of especial importance to sanitary authorities in the west of England. If it is important to them it ought to be made important to those who gain a livelihood by the sale of shellfish.

It hardly seems necessary to discuss the question whether specific diseases arise from the consumption of shellfish taken from polluted sources. We have the evidence of Professor Klein, who made investigations by direction of the Local Government Board, and which are recorded in the various annual reports of the Board's medical officer, showing that the *B. typhosus* as well as other intestinal organisms are demonstratable in polluted shellfish. Less scientific but quite as convincing evidence is given in the reports of various outbreaks of disease attributable to shellfish, such as that of Dr. Mearns Fraser, medical officer of health for Portsmouth, on the outbreak there in 1902. Here he found that the sole condition that was common to the whole of the cases was the ingestion of oysters. It was found that in every case the oysters had come from one particular laying, that these layings were in such a position as to be sewage polluted, and that this sewage had at times contained the excreta from typhoid cases. Such evidence seems complete. Recently we have had the evidence produced at an inquest at Exeter on a fatal case of acute poisoning after eating mussels taken from mussel-beds at Starcross, on the Exe. In 1912, outbreaks of enteric occurred in Derby, Leicester, and Sheffield, due to eating shellfish from the Exe and Teign.

There must be few medical officers of health who have not had to investigate the occurrence of cases of enteric fever in which the presumptive evidence points unmistakably to the consumption of shellfish as the cause. I know that scarcely a year passes during which I cannot account for one or two cases through the eating of polluted cockles.

Assuming it as a proved fact that disease is produced by infected shellfish, that these shellfish flourish in the estuaries of tidal rivers which receive untreated sewage from the towns and villages on their banks, and that there is considerable industry in the sale of shellfish: the question arises, what ought to be done to prevent disease being produced by them?

Much has been done by the Fishmongers Company in London to prevent the sale in Billingsgate Market of polluted shellfish. From the

years 1902 to 1909 they carried on a series of investigations to ascertain what shellfish coming into their market were polluted. Bacteriological examinations were conducted by Professor Klein, and when adverse reports were received inspectors of the Company investigated the local conditions. In this way the shellfish layings throughout the country were investigated; they were thus able to protect their markets, and also assist those employed in the industry by indicating certain places where the shellfish might be placed for a period prior to sale so that they could purify themselves. Further, from experiments of Professor Klein, it was shown that cockles and mussels if boiled for at least three-and-a-half minutes are sterilised. This process was not a success, as the purchasers objected to their altered condition. The Fishmongers Company then tried if steam for cooking would be more efficacious than water, and it was found that both cockles and mussels steamed for five minutes were sterilised, and the fish, according to experts from Billingsgate Market, were in good marketable condition and really, in appearance, better than when boiled. The Company then recommended cocklers to use a steaming apparatus, and also suggested the same to the Corporation of London; and I believe it has worked satisfactorily for some years. If steaming for five minutes is sufficient to sterilise shellfish without altering their appearance, surely dealers should be compelled to do this.

In the west of England the rivers with which we have to deal are the Exe, the Teign, the Yealm, the Fal, the Penryn, and Truro river. They are all tidal rivers into which considerable amounts of untreated sewage flow, and at their estuaries there is a big industry in the disposal of oysters, mussels, and cockles. Of these the Teign is the only one of which I have any personal knowledge. Now the whole of the sewage of Newton Abbot, population 14,000, and that of the villages of Kingsteignton, Bishopsteignton, and Coombe-in-Teignhead must eventually discharge their sewage into the estuary. Cockles taken from this source are undoubtedly subjected to sewage pollution. They are disposed of in various ways. On the banks of the Teign there is a beauty spot known as Coombe Cellars, which is far-famed for its cockle teas, and is visited by numerous people during the summer and autumn. At Newton Abbot quantities are sold every Wednesday, which is market day. Many are also disposed of at Teignmouth, Shaldon, and small villages adjacent to the river. They are also hawked in the borough of Torquay.

This leads us to the question, what can a sanitary authority do to prevent the consumption of such shellfish? The answer seems to be, nothing effective. The Fishmongers Company have practically barred the sale of

shellfish from layings which they know are polluted unless the precautions mentioned previously are carried out to their satisfaction. But how can an authority do this, as it is impossible to learn exactly where the shellfish come from, and beyond human knowledge to be able to detect signs of pollution without bacteriological examination. The only course left seems to be the warning to persons against the consumption of shellfish from such sources, and this we do regularly each summer.

I believe the Fishmongers Company have informed the principal persons engaged in the industry how to sterilise the shellfish by steam, but who is to see that this is done? Again, this will not affect the smaller dealers and hawkers.

In the city of Belfast, the authorities have for some years warned their inhabitants against the eating of shellfish gathered on the shores of Belfast Lough, and in 1911 they obtained, in a Parliament Act, power to frame the following by-law:—

> "It shall not be lawful for any person to sell within the city any shellfish collected from any part of the foreshore of Belfast Lough, and any person offending against the enactment shall be liable to a penalty of five pounds and a daily penalty of twenty shillings."

Here, then, it is possible for the authorities to entirely prevent the disposal of shellfish, but we are practically helpless.

The superintendent medical officer of Belfast informs me that he experiences much difficulty even when possessed of this by-law. He states:—

> "Our by-law is quite sufficient for its purpose if we could only find the hawkers before they have actually sold the shellfish; the trouble is, that it would require a staff of several men watching the foreshore in order to detect and prevent these men from gathering and selling the fish when they are not under observation. When we find any of them engaged in this trade we prosecute them, they then plead poverty, and either get off with a small fine or the case is adjourned; however, the last case which we brought to court the magistrates adjourned for a fortnight, and if this hawker is again found engaged in this business he will certainly be imprisoned.
>
> "I have no evidence that the introduction of the by-law has reduced typhoid fever, for, strange to say, during the year 1912 we had only fifty-four cases of typhoid altogether, while in the present year we have had almost that number already; but there is one peculiar thing I should like to mention, and that is, that seven out of the last eight cases of typhoid in this city had partaken of shellfish some time previous to sickening. This would appear to incriminate the shellfish, but I had a number of shellfish, found with the last hawker referred to, examined, also previous samples, and the bacteriological report was negative as regards typhoid bacilli. Again, practically every case of typhoid occurring in the city is treated in

the Infectious Diseases Hospital, the sewage from which is sterilised before being discharged into the town sewers. The question then arises, where the shellfish become infected? The opinion I have formed is, that if the typhoid in these instances referred to has been caused by the shellfish, it is due in some way or other to the sewage matter contained in those shellfish, although the typhoid bacillus has not been found."

I do not think that Dr. Baillie has considered the possibility of those persons who have apparently recovered from enteric, on their return home, having the typhoid bacillus in their urine and excreta. I have had an interesting though anxious experience of this during the present year. A series of enteric cases have occurred at intervals, and the only common factor appeared to be the milk from a certain dairy. The wife of the dairyman had enteric last July, and in April of this year, nine months after, I took samples of urine and fæces, and the Clinical Research Association report the presence of numbers of a bacillus which conforms in every respect with the *B. typhosus:* they also agglutinate with an animal typhoid serum up to 1, 10,000. Here we have an undoubted "carrier." Had she not been engaged in the milk business she might never have been the cause of other cases, yet would be daily infecting the sewage into which the discharges find their way.

I consider that pressure should be brought to bear on the county authorities to exercise the powers they have to prevent the pollution of these estuaries. If they had inspectors for these purposes, they could exercise supervision over the shellfish layings. No sanitary authority should be permitted to pour crude sewage into tidal estuaries. It may be argued that if treated this would not prevent shellfish being infected with disease germs. I believe that by reducing the amount of decomposible organic matter there is less likelihood of the germs living any length of time. In the report of the Royal Commission on Sewage Disposal, they state:—

"Foulerton draws attention to the effect of tidal and non-tidal streams respectively on disease germs. In the case of non-tidal streams, not only does dilution come into action at once, but the organisms are deposited along with the suspended solid matters of the sewage on the bed of the stream. The disappearance of these disease-producing organisms is due to the fact that they are best adapted for their growth in connection with some living organism, and so their environment at the bottom of the river is unfavourable to them. Therefore, in the struggle for existence between them and the bacteria naturally found in a good river water, the disease producers are at a heavy disadvantage, cease to multiply and die out. But in the case of a tidal stream the conditions are different. Here the disease-producing bacteria are deposited not only on the bed of the stream, but also on the mud or sludge on the banks, and are uncovered at low tide."

It seems that anything is good enough for a tidal stream, and until

sanitary authorities are forced by the Local Government Board to adequately treat their sewage in a manner similar to inland towns, the danger from disease and the nuisance arising from decomposing sludge and emanations from the growth of the *Ulva latissima* and allied growths, will still go on.

Since writing the above I have heard from the county medical officer of health, Dr. Adkins, who kindly supplied me with a copy of the report he made to the county council on his investigations into the cause of the Derby cases in 1912, and he shows the opinion from the county council point of view:—

> "I have to report that the letter received from the Medical Officer of Health of Derby, complaining of the typhoid fever caused by polluted mussels collected from the River Exe at Lympstone, was duly forwarded to the St. Thomas Rural District Council, with the result that the medical officer of health for that district was instructed to consult with me on that matter. We have made investigations of the laying of mussels in different parts of the River Exe, and had bacteriological examinations made of the shellfish and the water in which they are bathed. These results showed that the mussels and the river contain large quantities of the micro-organisms found in sewage; and we were of opinion that, owing to the large amount of sewage entering the estuary, mussels taken from any part might be the means of causing disease, especially when eaten raw, or become decomposed, or stale. We could find no place in the estuary where relaying may be carried out for the shellfish to cleanse themselves in purer water, and we therefore recommend the fishermen of Lympstone to appeal to the Board of Agriculture and Fisheries for a grant to erect experimental tanks for the cleansing of mussels in fresh water.
>
> "Since the receipt of the Derby letter I have received communications from Leicester and Sheffield, complaining of outbreaks of typhoid fever caused by the consumption of mussels taken from the rivers Teign and Exe. I have also investigated the condition of the last-named river. Here the conditions of sewage contamination on mussels is in stronger evidence, and no safe place can be found for the self-purification of the shellfish.
>
> "In the face of the above conditions the mussel industry in these two rivers, giving employment to about 150 men, with an annual taking of about £2,000, must in time practically cease for want of markets, unless the Board of Agriculture and Fisheries come to the rescue of these fishermen. No safety could be assured if the Local Government Board decided to make these tidal waters 'streams' within the meaning of the Rivers Pollution Acts, as it would be impossible for the authorities concerned with the discharge into these rivers to efficiently purify their effluents. I would, therefore, recommend that the different complainants be informed that, as no legal powers at present exist to prevent the collection and sale of these shellfish, and that no safety can be guaranteed if the tidal parts of these rivers were protected by the Rivers Pollution Acts, they should at present rely on their powers contained in the Public Health (Regulation as to Food) Act, 1907, and circulate the advice contained in Dr. Bulstrode's report to the Local Government Board, viz.:—

"'That those persons who desire to avoid contracting shellfish-borne enteric fever and gastro-enteritis should either abstain entirely from such shellfish as mussels (or cockles), or consume them only after they have actually been at the boiling-point for at least five minutes.'

"Since my last report the subject of the pollution of mussels in the tidal portions of the rivers Exe and Teign has been further investigated, and action taken thereon. The Board of Agriculture and Fisheries are prepared to give a grant for experiments to be undertaken with a view to the cleansing of mussels at Lympstone. The South Devon Fisheries Board are seeking to obtain a by-law prohibiting the taking of mussels from the rivers from the months of April to October (inclusive), during which time the shellfish are poor in quality, and more liable to obtain pathogenic germs.

"On account of several local outbreaks of typhoid being ascribed to the consumption of uncooked cockles, it was thought advisable that some action should be taken in regard to these shellfish. As there is little export trade in regard to cockles, and it would prevent the consumption altogether if they were included in the by-law, it was thought best to locally advertise the danger of eating this shellfish in an uncooked condition. The St. Thomas Rural District Council has already adopted the procedure, and I would suggest that the following councils, Exmouth, Teignmouth, Dartmouth, Dawlish, Totnes, Kingsbridge, Salcombe, and Newton Abbot should be requested to have notice boards, stating that 'visitors to this neighbourhood are warned that the above shellfish can be eaten with safety only after being thoroughly boiled for at least five minutes' posted up at the different railway stations or other suitable points."

Dr. George Adkins (Devon C.C.) said the Fisheries Board were giving a grant for experimental purposes for cleansing mussels; in the meanwhile they were using cleansing stations at Exmouth and Teignmouth. Mussels were laid there for a week, and after that time they were found sufficiently cleansed to be put on the markets. A by-law was also in contemplation prohibiting the taking of mussels from April 1st to October 1st. In April the mussels were not fit for consumption. The object of extending the by-law to October was to prevent the taking of the mussels until after the first floods had brought down the summer sewage and passed it beyond the mussel-beds into the sea, and thus given the mussels a chance to cleanse themselves.

During the investigations no evidence of typhoid fever was found among the fishermen or their children, where a large consumption takes place. There was some subtle connection between the *B. coli* and the *B. typhosus* when the former occurred in large numbers; experience was gained by that in South Africa. It was found that the mussel was a splendid medium for cultivating the *B. coli*, and therefore the danger arose in the time intervening between the collection of the mussel and its consumption.

DR. HERBERT WILLIAMS (Port of London) said the storage of shellfish in tanks, with a view to their purifying themselves before being sold, might answer in the case of oysters or mussels, but was not likely to be successful in the case of cockles, for Dr. Klein had found that the typhoid bacillus actually increased within the body of the cockle when so kept. The treatment of sewage, by whatever process adopted, would not render it safe to be discharged in the vicinity of shellfish-layings, apart from the important question of expense.

The recommendation of the Royal Commission on sewage disposal should be adopted by the inspection and registration of all shellfish-layings, and it should be an offence to take or sell shellfish from layings which had not been so registered by some responsible public body.

DR. WILLIAM G. SAVAGE (Somerset C.C.) reminded the meeting that typhoid fever was not the only disease spread from shellfish, and that outbreaks of mussel poisoning, with a number of fatalities, had been recorded. There were outbreaks of gastro-enteritis, and although probably bacillary in origin, they were not due to typhoid bacilli. The first principle to decide in the prevention of shellfish infection was whether they should try to stop all sewage pollution of layings by sterilization of sewage effluents, or see that their layings were in safe places. The latter was the only proper plan, since even if they only sterilized the sewage of the large towns they still had the pollution of the little hamlets and houses to deal with. It was not fair to require all sewage effluents to be sterilized in the interest of a comparatively small industry, when by the proper placing of these layings safety could be ensured.

The prevention of danger from shellfish layings was simple compared with many public health problems. The Royal Sewage Commission, as long ago as 1904, suggested the formation of controlling authorities, and the registration by these authorities of all proper places for shellfish layings, and the prohibition of layings in all dangerous places. They must, in addition, have control of the vendors of all shellfish by a system of licenses. Such licenses would be withheld if the sources of supply and the provisions for storage were unsatisfactory.

DR. H. W. BAILIE (Belfast) said that while polluted shellfish were a contributory cause of typhoid, even although *B. typhosus* had not been found, it was possible that the colon bacillus underwent some change capable of producing disease clinically similar to typhoid. In Belfast the same precautions were taken for many years for preventing the consumption of polluted shellfish, which had been taken since obtaining the by-law dealing with this matter, and apparently with as good results. However, he considered it better to have the by-law for protection in any action confiscating shellfish collected from the Belfast foreshore. The use of polluted shellfish should therefore be pre-

vented as a precaution against typhoid, in the same way as insanitary conditions, the use of contaminated food, milk, etc., should be prevented. By following these lines typhoid and continued fever had been reduced from 600 or 700 a year to less than 100 cases.

Dr. Black (Medical Officer to St. Thomas Rural Council) said they had never been able to trace an epidemic in the district due to mussels, and local fresh mussels seemed to stand out as perfectly good; yet the same mussels had, after transportation to the Midlands, been given as the cause of typhoid in three cities. By the voluntary co-operation of the fishermen they had practically secured registration and inspection.

Dr. T. W. N. Barlow (Wallasey) did not deny that shellfish from polluted sources caused typhoid and other diseases, but were they not too apt to look upon this matter without a due sense of proportion? As an etiological factor in the causation of typhoid it was not a very important or general one. Cockles and mussels were gathered in large quantities from the river Mersey, from places within a few feet of main sewer outfalls, and were largely eaten in Liverpool, Bootle, Wallasey, and neighbouring towns. The river Mersey received the crude sewage of about 1½ millions of people. In 12 years' experience as medical officer of health in Bootle and Wallasey, inquiries into all cases of typhoid fever notified had only resulted in the discovery of one case who had within six weeks previously eaten shellfish. The rapid tidal flow of the Mersey might be the cause of this immunity, but nevertheless the fact remained that mussels and cockles taken from this grossly-contaminated source were eaten (he presumed after boiling) without much danger.

Volume XXXIV. No. 9. Issued October, 1913.

JOURNAL

OF

THE ROYAL SANITARY INSTITUTE

CONGRESS AT EXETER.

SECTION A.—Sanitary Science and Preventive Medicine (continued).

Rabies: its Cause and Prevention, by CAPTAIN L. REYNOLDS, B.A., M.B., B.C., D.P.H.Cantab.

A SHORT time ago my friend Mr. B. Browning, D.P.H., Staff-Surgeon Royal Navy, knowing that I had worked in a Pasteur Institute for some time, suggested that I should read a paper on Rabies before this Congress. At first it seemed to me that such a paper would be of little interest to you, as this disease has for many years been almost unheard of in England. Further consideration has led me to alter my opinion, for the following reasons:—

Firstly.—The only antirabic treatment of any avail is that which was discovered by Pasteur, who might well be called the Father of Preventive Medicine. The series of experiments which led up to this great discovery must appeal to all who are interested in the prevention of disease.

Secondly.—The absence of any case of hydrophobia in England for many years is an excellent example of what State legislation can do towards stamping out disease.

Thirdly.—The experience of other countries shows that we can only keep free of this disease by taking advantage of our insular position, and by strict enforcement of our existing quarantine regulations. Consequently, although we are happily free from rabies at present, we must not forget that it is only just outside our doors, ready to make its appearance on the slightest opportunity.

Lastly.—Pasteur's antirabic treatment was an entirely new departure in medicine. It laid the foundation of the so-called vaccine treatment, which has given such wonderful results in tuberculosis, typhoid, and many other diseases.

The first mention of rabies as a definite disease is found in records of

the fifth century B.C., but it was probably recognised as such long before this. The very peculiar behaviour of a dog suffering from rabies, especially the failure to recognise his master, and the sudden purposeless attack on friend or foe without any provocation, is not likely to be forgotten. Following this unusual occurrence, within a short time, cases of hydrophobia would arise. Here again, we have a disease of most striking symptoms, to a certain extent resembling rabies in a dog. Even a most primitive people could scarcely fail to connect the two occurrences.

Formerly rabies was a widespread disease among dogs, cats, wolves, foxes, and jackals, causing a mortality of the people bitten by rabid animals variously estimated at from 15 to 80 per cent.

The terrible nature of hydrophobia was well known to the general public, and even exaggerated. To add to the horrors of the disease, it was thought by many that patients suffering from hydrophobia were not allowed to die, but were smothered with the connivance, if not with the active help, of the medical attendant. I remember, when I was a boy, hearing of this method of "cure," and there is an excellent example of this popular idea in Charlotte Brontë's "Shirley." Shirley Keeldar, after being bitten by a dog supposed to be mad, says to Louis Gerard Moore: "I want your promise; you know, in case the worst I have feared should happen, they will smother me. They always do this. My uncle will be full of horror and precipitation, and that is the only expedient which will suggest itself to him. Lock the door against the *Surgeons*. If I give trouble, with your own hand administer to me such a dose of laudanum as will make no mistake. Promise me that *you* will do this."

Charlotte Brontë must have had a very unhappy experience, both of doctors and uncles.

With the exception of cauterisation of infected wounds, no treatment of any value was known until Pasteur introduced his system. Among the many drugs which have been recommended for the cure of hydrophobia, charred wick of candle and cobweb (by internal administration) are of interest. It would tax the ingenuity of our present-day pharmacists to make an "elegant" mixture containing cobweb.

Rabies is a widespread disease. It was formerly common in England, France, and Germany. In Russia it was very prevalent indeed. In the United States many cases are reported, and in India the disease is exceedingly common. In England the infection was principally spread by dogs. Foxes and cats also suffered, and helped to infect man, but to a less degree. In 1895, before the Muzzling Orders were enforced, 672 mad dogs, and 55 mad animals of other kinds were reported in the United Kingdom.

The following figures show the number of cases reported in the Metropolitan district alone: in 1889 there were 176 cases; in 1890, 44; in 1891, 28; in 1892, 3. In 1890 the Muzzling Order came into force.

From 1889 to 1892, 25 persons died of hydrophobia in the United Kingdom, and 147 were sent to Paris for Pasteur treatment.

By the Muzzling Order all dogs found by the police without muzzles were captured, and their owners fined. Dogs which were not claimed within a certian number of days were destroyed. This worked in two ways: (I.) homeless dogs, which are particularly liable to infection, were destroyed; (II.) a mad dog with a muzzle on was not likely to pass on the disease. Thus rabies was stamped out in England. Reintroduction from abroad is prevented by the Quarantine Regulations, which require that every dog imported into England shall be segregated for six months.

In Russia wolves play an important part in spreading the disease. A wolf is a very powerful animal, much more difficult to overcome than any dog, and people bitten by mad wolves are often terribly mutilated. The risk of hydrophobia after infection depends very largely on the severity of the injury, so it is not surprising to find that the percentage of cases of hydrophobia is very high in those bitten by wolves; it has been stated to be quite 80 per cent.

In India, conditions are perfect for the spread of rabies. Large numbers of dogs are found in all bazaars and villages. Tolerated by the villagers, and even protected by them, they are owned by nobody, and pick up a living as best they can. Mongrels of all sorts are kept by natives as watch dogs, and lastly, there are numerous pariah dogs, or pi-dogs as they are often called, who wander about from place to place. These dogs do a certain amount of good in regions where sanitation is left to Nature, but this office would be equally well carried out by the crows, vultures, and other carrion birds, who are very fair scavengers.

In cantonments, where British and Indian troops are stationed, dogs are better cared for; in many all dogs without collars are shot on sight; in some they are licensed, and each dog must carry a disc attached to the collar, which bears the number of the license. This is certainly a move in the right direction. Registration should be compulsory in all cantonments, and owners should be more careful of their dogs.

Life in India consists of a series of moves, often at very short intervals, generally at still shorter notice. The result is that owners of dogs leave their pets behind to the care of friends, who do not like to refuse, but have little time or inclination to look after the pets of others. One often comes across a man with half a dozen dogs, and perhaps not one of these really belongs to him. Such dogs are allowed to wander about the

station, leading a life wrapped in mystery: this accounts for many cases of rabies among sahibs' dogs in cantonments, in which the source of infection cannot be traced.

Most of the Europeans treated at the Pasteur Institutes in India are infected by their own dogs, and not by pi-dogs.

Jackals are the worst sinners in spreading the disease in India. These animals, very like the fox in general appearance but not in color, are ubiquitous: in some places they are present in enormous numbers, and nowhere are they absent; they do not seem to fear man. In the hot weather they come into the gardens of private houses, and into the verandahs in winter. Just before leaving India I drove in a carriage within two or three yards of a jackal; he simply turned round, looked at me, and then quietly trotted off. This was in the hot weather in cantonments, and in daylight.

A mad jackal sometimes gets into a village and bites many natives and animals before it is despatched. In the hot weather when the heat rises above 100° F., natives sleep outside their huts at night, both in towns and villages; they do not seem to mind much where they sleep, and I have often seen them lying scattered about in the main street of a bazaar. A short time ago, there was an account in the papers of two natives who were killed by a passing motor; they were lying fast asleep in the roadway. Since such streets are often entirely dependant on the heavens for light, the only wonder is that such accidents do not more often occur.

Now it sometimes happens that in the depth of night, a mad jackal makes its way into a village where numbers of natives are lying about on the ground or on their native beds (or charpoys), more or less naked; taken at such a disadvantage it is not surprising that as many as 20 or 30 persons are bitten at times by one mad jackal.

Besides the animals already mentioned, horses, cattle, goats, deer, elephants, and camels also may be infected.

All warm-blooded animals may be experimentally infected.

A typical case of rabies in a dog presents the following features: The first thing noticed is a change in disposition, the dog becomes very irritable, avoids the light, and hides in dark corners. He often fails to recognise his master, snaps at anything presented to him, or even at nothing at all, the eyes are congested and red, the mouth and tongue are congested and swollen, there is marked salivation, with thick, frothy saliva. The bark is often quite changed in character, high pitched and metallic. In the early stages there is a tendency to wander over great distances; any rubbish, stones, bits of wood, straw, etc., is seized and

swallowed. All this shows that there is intense irritation of the nerves governing the mouth and throat.

A little later the dog becomes furious, lopes along straight in front of him, turning to neither side, biting at anything in his way, red-eyed, frothing at the mouth.

But for our knowledge of the danger of a mad dog, such a sight would be pathetic, not terrible. The poor thing is obviously very ill, and looks dazed and worried rather than fierce. Later on paralysis sets in, generally beginning in the hind quarters, and soon affecting the lower jaw. General paralysis is rapidly followed by death, the whole illness lasting three to five days.

Such a case of rabies is easily recognised by the most ignorant. Unfortunately there is another type of the disease, the so-called "dumb" or "paralytic" rabies. The disease is the same, but the animal does not become furious; often there is very little noticed, except that the dog is "out of sorts"; then there is slight weakness of the hind quarters, which soon develops into general paralysis.

I remember one case of particular difficulty, though such cases are unfortunately by no means rare. A spaniel suddenly became restless, changed in her manner, and wandered over great distances. She was shut up, but escaped, and was found many miles away. She was then kept under close observation, but there was very little to go on; she took her food, and wagged her tail at the sight of her master. I was watching this dog while she was being led on a chain for exercise, when suddenly she turned on her puppy and bit him severely without the slightest provocation. Both mother and puppy died of rabies.

The saliva of a dog is infective three days before it shows any sign of madness. Sometimes the first sign of trouble is in the throat. I have met many people who have run a very serious risk by examining the throat for a stray bone, little thinking that the dog was then suffering from rabies.

Puppies with rabies are particularly dangerous; they may show no signs up to the paralytic stage, and until this stage are full of life and play.

Dogs with rabies do not avoid water, as is generally supposed.

Rabies does not arise *de novo*, as was thought at one time, but is due to a virus or poison which is passed from animal to animal by means of the saliva; this virus is also contained in large amount in the brain, cerebro-spinal fluid, spinal cord, and nerves of rabid animals. In the lachrymal gland, pancreas, and mammary gland the virus is also present, but in small quantities.

The virus has certain very interesting features.

(i.) After infection, an interval or incubation period elapses before any symptoms arise; this suggests a living organism, rather than a toxin, such as snake poison.

(ii.) The virus will pass through a Berkefeld filter; that is to say, it will pass through channels too small to admit any known bacterium. This is true also of the virus of yellow fever, which, though yet undiscovered, is certainly a living organism.

(iii.) The virus is easily killed by heat, 50° C. destroys it in one hour. Exposure to air also kills it in a few days. These two facts suggest a very delicate organism, more delicate than any known bacterium, but an organism belonging to a higher class, such as that which causes malaria in man.

From time to time various micrococci and yeasts have been put forward as the cause of rabies, but have failed to substantiate their claim.

In 1903, Negri announced the discovery of certain peculiar bodies contained within the nerve cells of animals which have suffered from rabies; these bodies, which are so minute that the specimen must be magnified 1,000 times to see them satisfactorily, are round, oval, or sausage shaped, and vary in size from a speck just visible to three times the size of a red blood corpuscle. Their appearance varies with the method of staining, but with experience they can be recognised with certainty, and are accepted by experts as peculiar to rabies; that is to say, if these bodies are present, then the animal under examination *did* suffer from rabies. Negri bodies have never been found in the saliva.

Many other changes have been described, but none are peculiar to rabies. Negri is of opinion that the Negri body is a living organism belonging to the same family as the organism of malaria, and that it is the one and only cause of rabies. He has published some very interesting papers in support of this theory, but the matter is still *sub judice.*

In countries where rabies is common, the treatment of suspects is very important. The best plan is to tie up the dog in a room, make quite sure that he cannot escape, and that no other dog can get at him. If alive and well after five days, there is no danger to anybody who has been bitten. If the dog or other animal has been killed, the brain or whole head should be sent to a laboratory where it can be examined by experts. If possible, it should be packed in ice, and no preservatives used.

In handling the carcase of a suspect, it must be remembered, that should the creature have suffered from rabies, the saliva, brain, and spinal cord are still infective.

I will now endeavour to explain the rationale of Pasteur's antirabic treatment.

By inoculating a series of rabbits, one from another, with material containing the poison of rabies, that poison becomes stronger and stronger for rabbits, but less strong for other animals. Continuing this so-called passage of the poison or virus, a point is reached when the virus ceases to become stronger, but remains constant or fixed in strength. This poison is then called "fixed virus," to distinguish it from the original poison as found in the mad dog, which is known as "street virus."

Rabbits inoculated with fixed virus are known as "passage rabbits," because the virus has been passed from rabbit to rabbit.

If the spinal cord of a passage rabbit be dried, the strength of the poison diminishes from day to day, until on the fourteenth day it disappears altogether.

If a dog be inoculated under the skin, with the spinal cord of a passage rabbit which has been dried for thirteen days, and the inoculation repeated next day with cord dried twelve days, and so on from day to day until cord dried only one day is used, the dog becomes immune to rabies; that is to say, if street virus be introduced into the dog's brain, rabies does not develop. If such treatment be carried out after infection with street virus has already taken place, provided that only a short time lapses before the treatment begins, the dog does not get rabies.

Applying the result of his experiments to man, Pasteur began in 1885 to treat people bitten by rabid animals. The first patient was a boy named Joseph Meister, who was badly bitten on the arms and legs by a dog which was undoubtedly mad. An emulsion of cord dried for fourteen days was injected beneath the skin on the first day, and for thirteen days the injection was repeated daily, using cord dried for fewer and fewer days, until on the last day quite fresh cord was used; that is to say, starting with cord in which the poison had quite disappeared, the dose was gradually increased from day to day, until fresh cord was reached. The patient was alive and well five years after treatment.

A good example of the effect of treatment was published by Babes. Thirteen men and thirty animals were bitten by mad wolves. Twelve of the men came for treatment, and of these only one, who had been very badly lacerated, got hydrophobia. The man who was not treated died of hydrophobia, and every one of the thirty animals died of rabies.

Directly Pasteur published his discovery, patients from all parts of the world began to flock to him for treatment. In 1886, the first complete year of treatment, 2,671 patients were treated, with a mortality of only

0·94 per cent. All over Europe, institutes were started to carry out treatment on the spot, and thus save time, a most important factor.

In Odessa, the mortality among those treated remained considerably higher than at Paris; Pasteur thought this was due to the fact that in Russia many patients were badly bitten by mad wolves, and he suggested that in such cases more energetic measures should be carried out. His suggestion was adopted, with excellent results.

When a patient comes for treatment, all particulars are obtained from him, and the local authorities are written to, and asked for all details. All people who have laid themselves open to infection are communicated with, and every effort is made to induce them to come for treatment. Notices are sent to local authorities for posting, giving instructions to those brought into contact with mad animals. In this way every effort is made to extend our knowledge of the disease, and to obtain reliable statistics.

Since the Pasteur Institute was founded in Paris (1886), 33,387 patients have been treated; of these, 128 died of hydrophobia, a mortality of only ·38 per cent. The number of patients treated has gradually declined; in 1910 only 401 cases were treated, and in 1911 there were 342. Since 1909, there has been no case of hydrophobia amongst those treated. This great reduction in the number of patients is in part due to the establishment of Pasteur Institutes all over the world, but is largely due also to the action taken by local authorities.

In North Germany, rabies has been nearly stamped out by the Muzzling Orders and by the licensing of dogs.

TABLE A.—*Showing the Results of Treatment at the Pasteur Institute since it was founded.*

Year. 1886-1898.	Patients treated.	Deaths.	Mortality.	Year. 1899-1911.	Patients treated.	Deaths.	Mortality.
			Per cent.				Per cent.
1886	2,671	25	0·94	1899	1,614	4	0·25
1887	2,770	14	0·79	1900	1,420	4	0·28
1888	1,662	9	0·55	1901	1,321	5	0·38
1889	1,830	7	0·38	1902	1,015	2	0·18
1890	1,540	5	0·32	1903	628	2	0·32
1891	1,559	4	0·25	1904	755	3	0·39
1892	1,790	4	0·22	1905	721	3	0·41
1893	1,648	6	0·36	1906	772	1	0·13
1894	1,387	7	0·50	1907	786	3	0·38
1895	1,520	5	0·38	1908	524	1	0·19
1896	1,308	4	0·30	1909	467	1	0·21
1897	1,521	6	0·39	1910	401	0	0·0
1898	1,465	3	0·20	1911	342	0	0·0

Extracted from the "Annals of the Pasteur Institute, August, 1912."

DR. B. BROWNING (Sidmouth, Devon) said that Captain Reynolds had pointed out what a thin barrier existed between an outbreak of possible rabies and consequent hydrophobia in this country, due wholly to the rigid enforcement of the regulations *re* the non-landing of dogs from abroad, but showed how easily it might be evaded. The dogs who got in appeared to be in good health, but they might be actually in the premonitory stages of rabies, and afterwards, being considered unwell from other causes, could set up incalculable mischief amongst their masters and canine friends.

Dr. Browning related an experience of rabies gained during a residence of seven years in Brittany, many years since. In the hill country, the wolves, who were bold and numerous (he had seen three killed in one day's wolf hunt) were the chief propagators of rabies, infecting dogs, cats, lambs, and occasionally humans, and so spreading it both at first and second hand, in winter and summer, but mostly in winter. Owing to their numbers, a perpetual war was kept up against them, resulting in many cases occurring in men, who were bitten when attacking them when trapped, or if met with, or else who caught the disease from their bitten dogs, wounded in the frequent "louveteries" or wolf hunts. The lambs and cats were infected when seized by the wolves who were making predatory incursions, and had then lost the quarry, at once rescued by its owners. The repressive means consisted of shooting on sight every unfortunate dog who came under the suspicion (unfounded or not), and sending the majority of human patients to the Pasteur Institute; though occasionally, it was said, up the country, the friends quietly smothered the afflicted in their own homes, as Shirley Keeldar expected to be treated, and returned the cause of death to the Mairie as "loup" or "chien enragé." The master of the wolf hounds (the "louvetier") in each commune had a fund, from which the expense of transmission of poor sufferers to the Pasteur (Paris) Institute was defrayed. He saw a valuable setter shot on sight by a gendarme, just because it was lame from a thorn in its foot; no redress could be obtained. Many cases of hydrophobia occurring in Brittany were treated at the Paris Institute during his seven years' pilgrimage, but only few were fatal; all those not so treated died. The longest known period of incubation after bite by a mad animal was that of the Duke of Richmond, who was attacked in 1848, two and a half years after receiving his injury, and died without Pasteur's treatment, which, of course, was then unknown.]

Researches on Atmospheric Pollution in Exeter, and the Action of Coal Smoke upon the Fabric of Exeter Cathedral, by F. Southerden, B.Sc., F.I.C.

IN view of the increased attention which is being paid to the purity of town air, and of important investigations on the subject which have recently been made in manufacturing centres, such as Leeds and Glasgow, and in London,* it seemed interesting to ascertain the extent of atmospheric pollution in a comparatively small non-industrial city like Exeter. A series of sootfall determinations and partial analyses of accompanying rain-water have accordingly been made during the past few months at stations in different parts of the city; and although any detailed treatment of the results must await more protracted experiments, certain broad facts have already been made clear, and justify a preliminary communication on the subject.

The experiments have followed somewhat similar lines to those carried out by J. B. Cohen at Leeds. Apparatus consisting of a tall cylinder, in which rested a large funnel (about 9 inches in diameter), was exposed at four stations, so as to collect soot, dust, rain, etc., and the contents of each cylinder was examined at intervals. The suspended matter was separated by filtration, dried, and weighed, whilst the filtered water was reserved for the determination of dissolved solids, sulphate, chloride, and ammonia; the dry suspended matter, after weighing, was treated with ether in a Soxhlet extractor, for the extraction of tar (from contained soot), and the residue finally ignited, so as to obtain the weight of mineral matter or ash. The stations selected were: the roof of the University College (central); the roof of the Corporation Electric Power Station (industrial district); Gordon Road (suburban); and the Corporation Reservoir at Marypole Head (open country). The results are summarised in Table I.

As regards the dissolved matter, although considerable irregularities occur, it is clear that the total is least when the volume of rain is at a minimum, but that the concentration of the dissolved solids is then greatest. The purity of the rainwater collected at the reservoir (in open country, above and well outside the city, although less than a mile from

* See, for example, "Conference on Smoke Abatement," *Journ. R. San. I.*, Vol. 27 (1906), pp. 43–245; "Conference Proceedings: Smoke Abatement League," Manchester, 1911; Papers read at the Smoke Abatement Conference, 1912; "Sootfall of London," H. A. Des Vœux and J. S. Owens, *Lancet*, Jan. 6th, 1912; "Smoke," J. B. Cohen and A. G. Ruston, 1912.

TABLE I.

Locality.	Date.	Suspended Matter. Tons per sq. mile per annum. Total.	Tar.	Mineral matter.	Volume of water. Litres per ann.	Dissolved Matter. Tons per sq. mile per annum. Total.	SO₄.	Cl.	NH₃.	Dissolved Matter. Parts per million. Total.	SO₄.	Cl.	NH₃
Reservoir ...	Mar. 17—24	26·3	...	17·7	93·6	189	18·0	63·4	1·09	34·4	3·1	11·5	0·20
	Mar. 24—Apr. 13	41·0	...	31·8	26·3	38·3	6·4	10·0	0·88	24·8	4·1	6·5	0·57
	Apr. 13—26	38·5	...	23·4	74·1	73·1	13·0	26·0	1·63	16·8	3·0	6·0	0·38
	Average............	35·3	...	24·3	64·7	100·1	12·5	33·1	1·80	25·3	3·4	8·0	0·57
Gordon Road	Dec. 5—Jan. 2	86·3	4·9	51·6	48·9	112	23·9	44·2	3·15	38·9	8·3	15·3	1·09
	Jan. 26—Feb. 23	74·6	2·3	49·4	28·0	102	32·5	23·0	1·45	61·8	19·8	14·0	0·88
	Feb. 23—Mar. 9	155	2·8	132	10·0	82	7·9	13·5	1·87	139	13·5	23·0	3·2
	Average............	105·3	3·3	77·7	29·0	98·5	21·4	26·9	2·16	79·8	18·7	17·4	1·72
	Mar. 9—23	260	7·0	199	63·2	143	22·1	45·7	1·66	38·3	5·9	12·5	0·45
	Mar. 23—Apr. 6	172	7·0	126	33·5	117	18·6	13·8	2·37	59·2	9·5	7·0	1·2
	Apr. 6—May 11	174	7·6	111	...	...	...	...	...	...	...	...	...
	Average............	202	7·2	145	48·3	130	20·3	29·7	2·01	48·7	7·7	9·7	0·82
College	Dec. 2—30	139	6·6	71	39·0	113	21·7	33·9	1·69	49·2	14·8	14·8	0·74
	Jan. 14—Feb. 24	174	9·7	99	39·9	189	33·3	31·6	2·81	80·8	14·2	13·5	1·19
	Mar. 1—15	354	6·1	237	8·6	54·3	18·1	9·6	1·32	108	35·8	19·0	2·6
	Average............	222	7·5	136	29·2	85	24·3	25·0	1·94	79·3	21·6	15·7	1·5
	Mar. 15—29	266	6·4	184	77·7	131	39·0	52·0	2·86	28·8	8·6	11·5	0·63
	Mar. 29—Apr. 12	257	6·6	184	23·4	71·5	25·2	9·6	1·24	52·0	18·3	7·0	0·90
	Apr. 12—26	345	9·6	254	61·1	121	33·0	30·4	1·43	33·6	9·2	8·5	0·40
	Apr. 26—May 3	116	...	...	122·2	125	36·0	43·1	1·98	24·8	5·0	6·0	0·28
	Average............	246	7·5	207	71·1	112	33·3	33·8	1·88	34·8	10·3	8·2	0·50
Electricity Works...	Mar. 25—Apr. 9	496	4·2	342	27·3	94	17·9	12·8	1·21	58·4	12·5	8·0	0·75
	Apr. 9—27	971	10·8	794	72·6	240	36·4	32·0	0·38	56·4	8·6	7·5	0·09
	Average............	733	7·5	568	49·9	167	27·1	22·4	0·79	57·4	10·5	7·7	0·42

its centre) is very noticeably superior to that elsewhere; the proportions of dissolved solids and sulphate are only about half the values at the other stations, but there is no marked difference as regards either the chlorine or ammonia, so that these are presumably derived, in the main, from sources other than coal smoke. The total suspended matter is least at the Reservoir and greatest at the Electricity Works, whilst the figure for the College (central) station is also distinctly above that for Gordon Road (suburban), the latter being, however, more than five times as great as that for the corresponding period at the Reservoir; the sulphate figures follow a like order. The extremely local character of the pollution (both dissolved and suspended) is thus very pronounced. In the case of the central and suburban stations, the weights of suspended and dissolved matter brought down (calculated as tons per square mile per annum) is seen to be greater during the period Mar. 15 to May than for Dec. to Mar. 15, although the water collected is in all respects very much purer. This is accounted for, partly, at any rate, by the fact that a much larger proportion of rain fell during the latter period, and it is well known that heavy rain is much less concentrated as regards dissolved matter than light rain.

The following table gives averages for Exeter, as compared with those for Leeds and London:—

TABLE II.

Locality.	Suspended Matter. Tons per sq. mile per annum.			Dissolved Matter. Tons per sq. mile per annum.		
	Total.	Tar.	Mineral Matter.	SO_4	Cl.	NH_3
Exeter—Electricity Works ...	733	7·5	568	27·1	22·4	0·79
College	246	7·5	207	33·3	33·8	1·88
Gordon Road	202	7·2	145·5	20·3	29·7	2·01
Reservoir	35·3	—	24·3	12·5	33·1	1·80
*London—E.C.	426	—	—	68·7	27·7	48·6
S.W.	276	—	—	40·8	33·4	34·6
Sutton, Surrey ...	195	—	—	6·1	14·7	2·3
†Leeds—Industrial	440	31·2	236	54·0	44·2	4·08
Town	243	22·3	121	41·6	21·4	4·11
Residential	103	8·4	38·3	26·7	16·8	2·72

* Des Vœux and Owens (*loc. cit.*)
† Cohen and Ruston, "Smoke," p. 83.

The table has a general interest, although the figures are not really comparable, seeing that the observations were made at different times, and

doubtless with differences in the methods adopted, but it is clear that atmospheric pollution in Exeter is not of a very different order from that in larger towns. The investigation is being continued, and it is hoped to adopt the apparatus and procedure to be recommended by the Committee for the Investigation of Atmospheric Pollution, so that in future it may be possible to make a strict comparison of the results with those obtained elsewhere.

EFFECTS OF COAL SMOKE ON THE STONEWORK OF EXETER CATHEDRAL.

Different kinds of stone have been employed at different periods for the external fabric of Exeter Cathedral. For example, the Norman work, such as the Towers, Choir, and Lady Chapel, is of Salcombe stone from a quarry at Salcombe Regis, Devon, which has long since been worked out, but the later portions (Nave and West Screen) are of soft Beer stone, whilst Portland and Doulting stone, and latterly Ketton stone have been used for restorative work. These stones differ much in qualities and texture, but agree essentially in chemical composition; they are all limestones, and as such are especially sensitive to the dissolving and disintegrating action of acids. Experiments which have been carried out in London by H. Jackson and others have shown that the extent to which limestone buildings have taken up the oxy-acids of sulphur present in the atmosphere, as products of the combustion of coal, is very remarkable, the calcium carbonate of the stone becoming converted into calcium sulphate, often to a very large extent. This surface attack of the stone is considered to have a harmful influence, in that calcium sulphate is distinctly soluble in water and, moreover, slowly crystallises and expands in such a way that disintegration is brought about.

The extreme blackness of the lower portions of Exeter Cathedral and the deplorable decay (more particularly of the Beer stone) which has rendered costly restorative work, not only desirable, but imperatively necessary, suggested that probably the coal smoke of Exeter has played a not unimportant part in the work of disintegration, more particularly in view of the comparatively large, though very local, pollution of the atmosphere by smoke, already recorded. Experiments were first made to ascertain the cause of blackness. This is chiefly observable on the lower parts of the building, and especially on the northern face, but a closer inspection has shown that even the upper parts of the towers, where sheltered from the action of wind and rain, have become equally black, and that the apparently erratic (though highly effective) distribution of clean areas over the otherwise dark surface may in many cases be readily accounted

for by obvious local washing or by prevalent wind eddies determined by the rich irregularity of the design; sometimes also it is due to the scaling of the blackened surface layer to be referred to later. The blackening has been ascribed locally to various causes, such as the growth of vegetation, the deposition of soot,* and some inherent weathering quality in the stone. Chemical examination has, however, definitely settled the point, having shown that the blackened particles of stone are coated with a thin film of soot, and it has even been possible to extract a small amount of tar from the material. This finding has been confirmed by microscopic examination and by biological tests kindly carried out by Mr. J. L. Sager.

The establishing of this point led to systematic determinations of sulphate in the stone (which, in its original state, is free from sulphur), in order to get some idea of the extent to which the material had been attacked by the sulphur acids present in the air. The plan adopted was to rasp off successive ($\frac{1}{16}$ — $\frac{1}{8}$ inch) layers with a coarse file and determine the sulphate separately in each, the first layer removed being always of sufficient thickness to contain the whole of the discoloured material. The results are given in Table III.

The first four samples are of stone, in which the black layer formed an integral part of the block, being only removed by rasping, but samples

TABLE III.

		Percentage in successive layers.				
		A	B	C	D	E
1. Caen stone from pinnacle on S. side	Insoluble residue ...	10·79	8·70	8·86	8·88	8·49
	Calcium sulphate ...	21·31	2·42	0·66	0·41	nil.
	Ferric oxide	0·81	...	...	...	0·25
2. Salcombe stone, from top of S. tower (slightly blackened)	Insoluble residue ...	7·36	6·10	...	...	...
	Calcium sulphate ...	4·29	nil.	...	...	...
3. Salcombe stone (middle level: very black)	Insoluble residue ...	6·49	2·17	2·49	2·88	...
	Calcium sulphate ...	30·08	8·31	4·33	3·91	...
	Ferric oxide	1·19	...	...	0·60	...
4. Salcombe stone (low level, 10 ft. up: very black).	Insoluble residue ...	2·68	1·63	1·73	...	...
	Calcium sulphate ...	12·92	4·05	3·46	...	...
	Ferric oxide	0·44	...	0·28	...	...
5. Black scale (top of S. tower)	Insoluble residue ...	6·13	...	...	...	...
	Calcium sulphate ...	41·47	...	...	...	...
6. Black scale (N. face, 4 ft. up)	Insoluble residue ...	13·23	...	...	...	...
	Calcium sulphate ...	62·84	...	...	...	...
7. The same (another sample)	Insoluble residue ...	8·23	...	...	...	...
	Calcium sulphate ...	64·38	...	...	...	...

* It has been held that the soot is derived from the huge fifth of November bonfires which, until recent years, were lighted annually in the Cathedral yard, but this view is untenable, since the bonfires were built opposite the west front, whereas the blackening is general over all sheltered parts of the fabric, as already pointed out.

5 to 7 are of material which had scaled off from the main block, so as to be easily separated in the piece; in these latter instances the whole (about one-third inch in thickness) was powdered and analysed. It will be noticed that in all the samples, the percentage of insoluble matter is higher in the external layer than in the interior of the mass; and this would be expected seeing that calcium sulphate is somewhat soluble in water, and hence would be slowly removed by rain. The higher proportion of iron in the outer layer is probably accounted for in the same manner, although it may be due, to some extent, to iron present in the adhering soot. The sulphate in some cases penetrates considerably into the material, the distance increasing with the porosity of the stone, and, of course, with the increasing accumulation in the outer layer. Up to a certain fairly high proportion of sulphate the external layer appears to remain intact, but beyond this the outer layer scales off (see Nos. 5 to 7), owing probably to expansion accompanying slow crystallisation (as has been shown by others).* The exact conditions which lead to scaling are possibly not simple, but the extent of sulphate formation seems to be an important factor, and the destructive influence of sulphuric acid is therefore doubly important, for in the more sheltered situations it leads to disintegration by scaling, and in exposed positions calcium sulphate is formed and dissolved away, thus hastening the destruction brought about by more natural agencies, such as frost, wind, and rain.

In view of the fact that the stone replaced in restoration is chiefly the soft Beer stone used in the more modern portions of the fabric, whilst the older work of Salcombe stone remains comparatively sound, it was decided to compare the resistive qualities toward acid fumes of Beer and Salcombe stones with those of the Ketton stone used at the present time. Three similar and typical blocks ($3 \times 3 \times 2$ inches) were accordingly prepared and placed under a large glass bell, which contained also a jar partially filled with a solution of sulphurous acid. The blocks were symmetrically supported, each in its bedding plane, with the jar centrally below, and after four weeks, during which time the cover was occasionally removed for a few hours and the solution resaturated with sulphur dioxide, the blocks were exposed to the ordinary atmosphere for six days. Then one-eighth inch was removed from similarly disposed vertical surfaces, the powdered material was oxydised with bromine water (to convert sulphite

* An alternative hypothesis should, however, be mentioned, viz., that the high proportion of sulphate is an effect and not a cause of scaling. For, supposing that the loosely adhering scale were to remain in position for a prolonged period, the inner as well as the outer face would be exposed to air, and sulphate formation would proceed more rapidly. This undoubtedly occurs, but to what extent has not yet been ascertained.

into sulphate), and the sulphate was determined. The results are given in the table which follows:—

TABLE IV.

	Percentages.		
	Beer.	Salcombe.	Ketton.
Insoluble residue	1·70	2·34	0·39
Calcium sulphate (including sulphite)	10·99	2·25	12·97

The results are striking, but must doubtless be interpreted with caution. Experience has shown the superiority of Salcombe stone over Beer stone, and this is fully supported by the above test; but the fact that Ketton stone is attacked by acid with great ease must be considered in conjunction with its hardness and uniformity, in which respects it is certainly superior even to the Salcombe stone. In practice, the chemical properties of the stone cannot be dealt with apart from its behaviour under mechanical tests, but at the same time the above result must be regarded as significant, and it is intended to apply the method to the comparative examination of other building stones. It is interesting to note that in spite of the very appreciable extent to which the samples were attacked, no change was apparent to the eye, even with the aid of a lens. To the chemist, no limestone can be regarded as an ideal material for building purposes in a smoky town; but the architect has to take a broader view, and in the case under consideration in particular, the choice of a suitable stone is narrowed by the necessity for the new work to harmonise as far as possible with that already standing.

In conclusion, I have to express my thanks to the Dean and Chapter for their kindness in allowing me to take samples and make observations at the Cathedral, as well as to Mr. Harbottle, the architect, and Mr. E. Luscombe, who have taken much practical interest in the work.

The Hygienic Aspect of the Physical Properties of the Chief Textile Fibres, by A. E. GARRETT, B.Sc. by Research (Lond.), F.C.S., Member of the Textile Institute (MEMBER).

THE hygiene of clothing has unfortunately taken such a second-rate position among questions relating to public health, that one is glad of an opportunity to bring forward a few facts demonstrating the importance of a more intimate knowledge of the physical properties peculiar to the chief fibres employed in the manufacture of clothing fabrics.

Incidentally, I might mention that this state of apathy does not extend throughout the British Empire, as is evidenced by the space given to clothing in the hygiene section of the McGill University, Montreal. For some three years past Mr. H. F. Tomalin and myself have been collecting and classifying fabrics, etc., and have prepared a text-book dealing with this important section, on lines suggested by Dr. T. Starkey, Professor of Hygiene at that University.

There have, of course, been numerous treatises in which the hygiene of clothing is dealt with in varying degrees of completeness, but the general tendency is to make the portion devoted to it as brief as possible.

The properties of fibres and fabrics, from the hygienic standpoint, have been investigated by Coulier, Hammond, Jaeger, Pettenkofer, and others: while Lees, who approached the question from the purely physical standpoint, included cotton, silk, wool, etc., in his conductivity experiments.

I shall have occasion to make use of some of the results obtained by these observers, but also place before you some simple, and I believe novel, methods of demonstrating the truth of the principal statements made.

The human body is homoiothermal, and may be looked upon as an engine which obtains its energy from the fuel, in this case oxygen and food, supplied to it, and loses much of that energy by dissipation of heat from its parts. Eighty per cent. of the heat lost is owing to the evaporation of perspiration, to radiation and conduction.

When the temperature of the surrounding air is lower than that of the body, the proper retention of energy, otherwise lost by radiation, must necessarily be an important factor in the selection of effective protection by day or night. Some covering must therefore be adopted which reduces this loss to a minimum, and yet allows the skin to perform its natural respiratory and secretory functions. Where sudden climatic changes occur it is evident that even more care should be given to the choice of form and material in clothing, to protect against chills, to assist the

circulatory organs in regulating the heat lost from the skin (particularly dangerous when, in addition, the garments are damp), and to prevent the undue influence of heat from external sources.

Heat conductivity.—We accordingly examine the fibres and fabrics used in the production of clothing to ascertain which is the slowest conductor of heat. The researches of Pettenkofer, Lees and others show that plant fibres conduct heat much more rapidly than those of animal origin; so that, if the conductivity of linen be taken as 100, that of wool ranges between 50 and 70. The conductivity of either is of course extremely small, and it is no doubt on that account very frequently considered a matter of small importance whether our covering is of cotton or wool, at least, so far as certain parts of our clothing is concerned.

I would like to introduce to your notice a very simple piece of apparatus familiar to many in their school days, but not then applied to quite the same use. It is a modified form of the differential air thermometer, the action of which depends upon the fact that air, when heated, expands.

Connecting the two equal-sized bulbs, A and B, is a piece of capillary tubing containing coloured alcohol, C; when the air in the two bulbs is at the same temperature the liquid remains midway between them, but if the temperature of A is raised ever so slightly, the air on that side requiring more room pushes the liquid toward the cooler bulb, B. Now, if A is covered with a cotton, and B with a woollen fabric, and the hands (when at the same temperature) are placed one on each bulb, that material which allows the heat to pass through least readily, will be on the bulb towards which the liquid moves. By this simple means it is readily demonstrated that, so far as retention of heat is concerned, an open weave is preferable to a close one, cotton to linen, and wool to cotton.

To make an experiment in which conditions exist somewhat approximating those under which clothing is tested on the body, I suggest that a porous cylindrical earthenware pot, such as is used in electrical batteries, be filled with water at 110° F., and the times required for the temperature to drop to 95° F. be noted, when it is covered in succession with a layer of cotton, linen, wool, etc., of the same uniform thickness. Care, of course, must be taken to so insulate the vessel that practically all the heat lost passes out *via* the material. In some tests I made in this way, I found that if the time taken for flannel is 100, that for a wool and cotton union is 87, and that for calico, 80.

This clearly shows that woollen material under ordinary circumstances is a much slower conductor of heat than materials made of plant fibres; one is also struck by the great difference in the apparent dampness of the

cotton and wool fabrics at the end of such an experiment. This brings us to the second point, the absorption of moisture.

Absorption of moisture, etc.—The perspiration, invisible and otherwise, given off by the body must be disposed of, and, since an excessive secretion is a comparatively frequent occurrence to normal individuals, all clothing, but particularly that next the skin, should be readily able to absorb a fair quantity of moisture without its presence becoming evident; in other words, the material should not feel damp. Where the quantity of moisture is so abnormally large that it cannot be absorbed, and, in consequence, the material feels damp, it should not feel cold. That all materials do not feel equally cold when wet can be proved by taking a piece of wet flannel in one hand and wet flannelette in the other, the latter will feel much cooler.

When there is abnormal perspiration during exercise, the reduction by evaporation of the excess heat is not harmful, but, after exercise, the evaporation continues, and the danger of a chill may arise. Woollen clothing at this time condenses and absorbs the vapour, the latent heat released (536 heat units per gram) is mainly held by the material, and, in consequence, the covering feels warm at once, while being a relatively slow conductor, it remains so for a lengthy period. This also helps to explain why woollen garments do not become so maladorous as those of plant fibres. The heat held by the wool causes the volatile matters to quickly escape. With cotton and linen the vapour condenses on the inner surface, *i.e.*, next the skin; the heat released is rapidly conducted away, and the subsequent evaporation again requires heat from the body. This refers to the behaviour of a closely-woven material of plant fibre. Where it is of open texture, some of the vapour passes off without condensation, and, therefore, without releasing so much of its latent heat.

The action of moisture on a woollen fabric is peculiar, and when in excess shows three stages. First, the vapour exhaled from the body condenses, becomes absorbed in the fibres, and gradually evaporates. In this stage, the action is not apparent. Second, when the absorption limit has been reached, further moisture causes that already absorbed to exude from the outer surface, where it appears in beads. An example of this can be seen on the woollen rugs worn by a horse after a race. During this stage the under surface still feels dry. Third, if the excess goes beyond the limit of the second stage, the final condition is reached, and the wool becomes saturated. When this occurs, the natural structure and elasticity of wool prevent close contact with the skin. Owing to this, and to its relatively slow conductivity, the damp woollen garment does not create the chill which is felt with one of vegetable origin under similar conditions.

It should, however, be pointed out that the chemical processes which some woollen garments undergo, in order to reduce their liability to shrink, tend to alter their powers of absorption of water to such a degree that they sometimes are little better than cotton in that respect. By simply placing a square inch each of wool stockinet and flannelette on the surface of some water, the very rapid saturation of cotton can be readily contrasted with the extremely slow change which takes place in the wool: but it must by no means be concluded on that account that plant fibres are better absorbers of moisture.

Their action is a very different one from that of wool: It consists mainly of attachment due to capillary attraction, and must be looked upon as an instance of adsorption, rather than of absorption; the material in consequence quickly feels damp. Owing to this loose attachment the moisture is lost more rapidly by evaporation; a considerable amount of heat (latent heat of vaporisation) is thus rapidly abstracted from the body, and a chill may result; while the absorbed moisture in wool, not being so free, evaporates more slowly, and the loss of heat is more gradual.

It must also be borne in mind, that except under abnormal conditions of heat production, such as excessive exercise, the rapid evaporation from cotton or linen only lasts sufficiently to produce a chill, and then proceeds at a slower rate than in the case of animal fibres.

To show experimentally that there is a decided difference in the power of wool and plant fibres to hold moisture, all that is necessary is to weigh two or three representative samples of material (say five grams each) and then dry them in an oven at a temperature of 100° to 110° C. It will be noted that in ten to fifteen minutes the cotton and linen materials will have lost all their moisture, while to accomplish this with the wool will take quite twice as long. This has been done many times by students under my supervision in the Textile Analysis Classes at the City of London College, and they are always struck with the fact that it requires such an amount of trouble to reduce wool to absolute dryness.

Parkes states that the hygroscopic absorptive power of wool is at least double that of linen and cotton in proportion to its weight, and quadruple in proportion to its surface.

The absorption of moisture affects the weight of fabrics sufficiently to be taken into account commercially.

A certain standard has been fixed by conditioning house authorities. Weight when absolutely dry is taken, and the following percentages of regain is allowed:—Worsted yarn $18\frac{1}{4}$, worsted and woollen cloth 16, flax 12, silk 11, cotton $8\frac{1}{2}$.

This property of being able to remove moisture by absorption from contact with the skin is a very important one. When the evaporation of the absorbed fluid takes place, heat is extracted for this purpose from the material in question, which if a bad conductor, *gradually* takes the heat it requires from the body, and so the process has far less effect on the body temperature than is the case when the heat is taken directly from the surface of the body. Where a garment with less absorptive power is worn next the skin, the loss of heat and consequent change of temperature are much more rapid. Again, water being a relatively good conductor, the fabrics which easily become damp have their powers of conductivity greatly increased during excessive perspiration. This point is particularly pronounced in cotton material with a raised surface. Though an unusual quantity of air is held, and only the points of the brushed-up surface touch the skin, thereby lessening the conductivity, the absence of hygroscopic power more than nullifies that advantage, as moisture, when present, replaces the air to a considerable extent, and induces closer contact with the body, due to the surface becoming flattened.

It must be understood that textile fabrics also absorb moisture from the atmosphere. That is one reason why, when the air is highly charged with moisture, those engaged in outdoor work become exhausted more quickly. The air in the minute interstices of the clothing becomes charged with the moisture, which increases the conductivity, and the individual not only loses energy, but is chilled owing to loss of heat. Another reason is that the skin glands become clogged by secretion, which naturally evaporates less freely into an atmosphere already heavily charged.

Before leaving this question the absorption of sebum requires brief mention. This fatty matter excreted from the sebaceous glands should be absorbed by the clothing worn next the skin, to obviate clogged pores. Animal fibres absorb these excretions: vegetable fibres do not.

The last important physical property, porosity, which has to be considered, is one which depends to a certain extent upon the manufacturing processes.

Porosity.—Perhaps the best method of illustrating the relative porosity of fabrics is by photographs showing the texture of the materials.

A very effective, though simple, method of proving that air passes through woollen material easier than through a thin cotton fabric (calico) is as follows: a glass vessel with openings at the top and at the base is filled with water, the lower opening being closed with a cork. A cork having a hole about a quarter of an inch diameter, or better still, a number of very small holes, bored through is inserted at the top opening,

and a piece of the material to be tested is tied firmly over the top of this cork. The cork is removed from the lower opening and the water escapes, air entering at the top to replace it.

When woollen material is used, the air enters so easily that the water rushes readily out. When calico is used only a feeble stream issues, and in a little time the air also enters the lower opening bubbling up through the water.

According to Parkes, the relative amount of air which can be driven through different materials in a given time under a given pressure is as follows:—Through flannel, 1041; through linen, 603; through silk fabric, 414. These observations are confirmed by those of Pettenkofer, who found that flannel is more permeable to air than linen in the proportion of 100 to 58; flannel is excelled in this respect by woollen fabric of stockinet weave. It has been computed that in smooth linen the amount of solid matter is about 58 per cent., the air space therefore 42 per cent.; while in closely woven wool only 13 per cent. is solid, and 87 per cent. air space.

A relatively open texture is important, to prevent the CO_2 and other exhalations from the skin being retained between the clothing and the body. About ten grams of CO_2 are given off daily by the skin, and an equivalent amount of oxygen absorbed. It is estimated that a normal person loses in weight about one sixty-seventh through the skin in the form of solid, liquid, and gaseous matter, in twenty-four hours. Hence, there should be as free a passage as possible from the skin to the outside air if the respiratory and secretory functions are to be properly performed.

The benefits derived from woollen fabrics are consequently not confined to those due to their peculiarly low conductivity of heat and good absorption of moisture, but become even more apparent when their texture is also considered.

Influence of Colour.—There are other physical properties which have a more limited influence over the choice of clothing, *e.g.*, the ability to reflect or absorb the heat of the sun's rays.

Colour, which has practically no effect on the radiation of heat from the body, must be taken into account when considering the influence of heat from external sources. It is a well known fact that those colours which reflect most heat absorb least. The ascending order of the power of absorption is: white, pale straw, dark yellow, light green, Turkey red, dark green, light blue, and black. According to Krieger, if 100 be taken as the absorptive power of white, that of black will be 208. One can readily see, therefore, that light coloured outer garments are more suitable for higher temperatures, dark for lower.

Light coloured cotton and linen have considerable power of reflection, but their relatively high conductivity and inability to allow moisture held in contact with the skin to escape, quite over-rides this factor. Again, there is a danger of chills when animal heat is diminished, *e.g.*, when resting after exercise ; and when the atmospheric temperature falls rapidly as it does at night in the tropics. Hence, wool is recommended for tropical regions by the Royal Geographical Society and other authorities.

It has also been stated that dark colours absorb odours more readily than light ones. Stark's observations make the ascending order the same as that given for absorption of heat.

Friction.—There are those who argue that it is not possible for persons with very sensitive skin to wear woollen undergarments with comfort. No doubt the structure of the wool fibres tends to create a slight friction against the skin, and the resulting increase of blood on the surface facilitates the secretive action. This stimulation is due mainly to the ends of the fibres which project owing to their curly structure. The frictional action, as stated, tends to cause the minute blood vessels to dilate. This is regarded by some to be almost a negligible factor, but it exists and should be taken into consideration. On the other hand, it must be remembered that the manufacturing processes have improved in modern times, and it is now possible, by using certain wool and methods of spinning and weaving, to reduce the disturbing effect of friction. Where the skin is very sensitive, a silk vest of "gauze" texture can be worn with a woollen shirt, but such cases are rare, for after a short time very few are unable to wear a relatively smooth woollen garment without discomfort.

Efficient as it is for all purposes of clothing, wool is in some respects surpassed by the hair of the camel. This commodity, obtained almost entirely from the Bactrian camel of Asiatic Russia and China, is not so plentiful as wool, but still is not so scarce as to render its price excessive. Fabrics made from it are remarkable for their lightness. It is also found to exercise a more hardening effect upon the tissues than wool, and it helps to disperse fatty secretion more readily. Underwear of this, however, cannot be woven of sufficient durability to withstand the friction imposed by continuous movement, but material highly suitable for bedding, etc., is constructed of camel's hair.

Inflammability.—That woollen fabrics are to be preferred is evident from the desire to imitate their texture in materials of the flannelette type. Owing to its raised surface, produced by the fibres being brushed up and loosened to lessen the conductivity, this material is rendered highly inflammable. This fact has been given such publicity of late, that it is

only necessary to remind you that while plant fibres generally are highly inflammable, those of animal origin merely smoulder, and are consequently not dangerous when stray sparks and flames are in evidence. The reason is obvious when it is remembered that cellulose (the main constituent of plant fibres) contains nearly 50 per cent. oxygen, while wool only contains about 20 per cent., and in addition quite a large percentage of nitrogen.

On physiological grounds, animal fibres, such as wool, camel's hair, etc., by reason of their peculiar physical properties, must be considered as the best suitable medium for the production of clothing. The extensive use of silk, preferable to plant fibres, though less efficient than wool, is not practicable on account of its cost.

CONGRESS AT EXETER.

Section B.—Engineering and Architecture. Presidential Address, by H. PERCY BOULNOIS, M.Inst.C.E., late Deputy Chief Engineering Inspector, Local Government Board for England (FELLOW), President of the Section.

IT is exactly forty years ago that I had the honour of being appointed City Surveyor of Exeter. I little imagined then that some day I should be in the proud position of President of this Section, or that I should ever be elected as Chairman of the Council of The Royal Sanitary Institute, a position which I have just vacated after two years of service.

As a matter of fact, the "Sanitary Institute," as it was called for many years, was not founded till the year 1877, and it was not till three years afterwards, 1880, that it held a Congress in this ancient and loyal City of Exeter. Dr. Domville and I were the joint secretaries, and the Congress was an unqualified success.

I well remember that Congress, for I read a paper on "Sewer Gas Annihilation," in which I advocated a process for the absorption of sewer air by earth in a simple manner, which I had successfully carried out in some sewers in this city. The late Sir Robert Rawlinson was the President of the Section, and he threw such cold water on my suggestion that I did not proceed with it. Some years afterwards, speaking at a meeting of engineers, Sir Robert Rawlinson spoke in different terms of these proposals, and said he remembered that some years ago a young man had suggested a plan for the absorption of sewer air by earth, which appeared to have a good deal to recommend it under certain conditions. It was, however, too late, and I have never continued any further observations in this direction.

I remember also, at that Congress in 1880, Dr. Frank P. Perkins read a paper on the amount of organic impurity in the River Exe, from which the water supply of Exeter was, and is still, taken. I had furnished him with the samples of water, which he had analysed, and added some remarks to his paper. We proved, I think conclusively, that although the whole of the sewage of Tiverton, some ten miles above our intake, was poured into the Exe, without any previous treatment, the water of this river became purer and purer, until at the point of our intake it showed no traces of the pollution it had received from Tiverton.

As a matter of fact, the water of the Exe at our point of intake was perfectly free from any suspicion of impurity, and this condition of the

water obtains to-day, for since 1880 the town of Tiverton has installed some very extensive sewage purification works, and the water of the Exe is now filtered on a very large scale near the point of intake.

Passing now to more general subjects; what strides have been made in sanitary engineering, and architecture, since the year 1880.

It is almost impossible to realise how greatly the conditions of mankind have been improved by the application of sanitary science for their betterment. When I was appointed in 1873, you must remember that the great Public Health Act of 1875 was not in existence, and the administration of sanitary legislation was most difficult and cumbersome.

Since that date, almost every year has produced further sanitary legislation until we almost cry for a little breathing time, and ask that there should be a little less legislation and a great deal more education on sanitary matters.

In connection with the changes that have occurred in sanitary science since the Congress of 1880, it is interesting to know that the late Lord Fortescue, who was president of that Congress, condemned the main drainage system of London, and in his Presidential address, he reiterated the then prevailing cry, "The rainfall to the river, the sewage to the soil." I myself, led by this popular cry, designed a scheme for dealing with the sewage of Exeter by which about 700 acres of land lying to the west of the Ship Canal could be irrigated with sewage. It is almost needless to say that this happily was never carried out.

It would be difficult, nay impossible, to estimate, even approximately, the amount of money that has been expended since 1880 in attempts to make the disposal of sewage a commercial success.

Costly experiments were tried and much intellect wasted on various methods for the treatment of sewage, and it was not till the Royal Commission on Treating and Disposing of Sewage issued their valuable fifth report in 1908, that order was evolved out of the chaos that preceded it.

Referring again to the Congress in 1880; Sir Robert Rawlinson, in seconding a vote of thanks to Lord Fortescue, spoke very strongly on the importance of a trap on the house drain; he said, "The house drains should be cut off effectually from the sewers, and there should be no possibility of sewer gas entering the walls of any human dwelling." The recent report from a Departmental Committee of the Local Government Board practically condemns the use of traps on house drains, and advocates the principle that the house drains should assist in the ventilation of the sewers. These are two evidences of the great change of thought that has taken place with regard to sanitary science since the year 1880.

Then with regard to sanitary fittings; I remember in 1883 having the

greatest difficulty in persuading a bench of magistrates that a pan closet was an objectionable nuisance, and it was only on bringing the offending apparatus into court and explaining its unsatisfactory and insanitary working parts that I was with difficulty able to secure a conviction.

Now I believe the pan closet is a thing of the past, and all sanitary fittings are very nearly ideal at the present moment, as a visit to the Exhibition in connection with this Congress will reveal.

Look, again, at the improvements in our streets and roads since 1880. Wood pavements and asphalte have taken the place of macadam and cobble stones in our cities and rural districts, and bituminous binding of our roads in the rural districts is largely being substituted for the old-fashioned water-bound macadam.

These improvements have added greatly to the sanitary condition of our towns and villages, and have lessened the cost of scavenging. In this latter connection we must not lose sight of the fact that the introduction of mechanically-driven vehicles has lessened and will still further diminish the amount of animal organic matter on our streets and roads.

Then with regard to the disposal of house refuse by cremation. This has materially improved sanitation; the huge refuse-tips of the past are now very rarely seen, and the recent discovery that the house-fly is an active carrier of some diseases has made the disappearance of the refuse-tip even more important.

Great strides have also been made in the question of housing the working classes by the advent of the garden city, and the introduction of town planning on scientific and artistic lines, and the spread of easier and cheaper methods of locomotion have gone far to lessen the difficulties of the problem.

Improvements in building materials, in house fittings, and in furniture, have been numerous. The construction of the ideal home has very nearly been reached. Warm in winter, cool in summer, perfectly dry throughout, well ventilated and lighted, no dark holes or corners where dirt or dust can accumulate unseen, the maximum of possible sunshine, the minimum of possible inconvenience, all these can be, and are, obtained by the skilful and up-to-date architect.

It would be impossible in a short presidential address to touch upon one-tenth of the progress that has been made in sanitary engineering and architecture since the year 1880. But these sciences have no finality: much has been done in the past, but much still remains to be done in the future. We can look with some satisfaction on what has already been accomplished, but when we look around us and see the dirt and squalor in which so large a proportion of our population still live, we realise that up

to the present we have only just touched the mere fringe of the great problem which is before us.

There are still hideous slums in which dirt, disease, ignorance, and vice abound, and which require improvement. There are still too many insanitary houses in our midst; some of our water supplies are not above suspicion, especially in rural districts; there is still a large number of sewage works which are not all that could be desired. There are miles of narrow streets where the sunshine cannot freely enter; the paving of our streets and roads is a long way off perfection. We are still baffled with the difficult problems of perfect ventilation and heating; our methods of house refuse collection are still cumbersome, old-fashioned, and far from sanitary. We know that zymotic diseases and consumption still claim their thousands of victims every year.

But what would have been the condition of the world without the work which we have done? Can one conceive what would have happened if no one had endeavoured to cleanse the Augean stable which existed 80 or 100 years ago, or, at an earlier date, when terrible scourges of plague, cholera, and the sweating sickness swept over the world? These have happily disappeared in all civilized countries where the sciences of preventive medicine, sanitary engineering, and architecture have been brought to bear. The concentration of large populations in cities and towns would have been impossible but for these efforts, and the work of the world would have been seriously impeded. It is impossible to overrate the importance of sanitary science in all its branches; without it all other enterprises must have failed.

It is this knowledge of the importance of our work which should spur us forward to further action, and though we may sometimes be disheartened by the apathy and ignorance which we may have to encounter when matters of sanitation are brought forward, let us look on the bright side of the question, and ever press forward and strive for the ideal civilisation when preventive disease will be a thing of the past, and "the perfection of all things" will be reached.

At the Exeter Congress in 1880, the late Benjamin Ward Richardson gave the lecture to the Congress on "Woman as a Sanitary Reformer," and he concluded an admirable address with the beautiful text, "Her children shall rise up and call her blessed."

Let us apply that text to ourselves, and trust that the work which we are doing, however small, in the cause of sanitation will bring each one of us some small recognition from posterity.

> "We are children still, wayward and wistful; with one hand we cling to the familiar things we call our own, whilst with the other, resolute of will, we grope in the dark for that the day will bring."

Water Supplies from Rivers, by William Phelps (member.)

THE settled policy of the Metropolitan Water Board is now to store and utilise increasing quantities of water from the old sources, making use of all possible means to efficiently purify the supply and guard against possible accident. It can scarcely be denied that this policy appears to have been so far justified by its results. Be this as it may, it is not here intended to call it in question, but rather to suggest that it is an example to be followed with extreme caution.

The metropolitan supply is by its magnitude, and for other reasons, a problem apart from water supply in general, and it is here intended to consider those supplies for rural districts (for which a definite policy may be required and adopted with advantage) rather than even the supply of our moderate towns, where, generally speaking, a definite supply and settled policy, either good or bad, has already been adopted and is in work.

If we look abroad we find that in America, North and South, the circumstances are such that rivers are to a great extent the only available sources of supply. The author, some twenty years since, had some experience in sewerage and water supply for South American towns, and need only say that to see the vast rivers there dealt with is sufficient to banish the thought of serious pollution. Nevertheless, these towns were even then alive to possible danger, and the city of Buenos Aires, which draws its supply from the Rio de la Plata, protested against the discharge of the sewage from Rosario, 250 miles higher up, into a river which is there about a mile in width. Reports by the late Sir Joseph Bazalgette and others as to the oxidising powers of these vast bodies of water served, however, to allay apprehension.

On the continent, whilst during the past 15 to 20 years Germany has adopted the plan of more extensively using river and surface supplies, France has adopted a reverse policy.

It may be said, then, that there is no consensus of opinion towards a general policy of forsaking river supplies either here or abroad.

To what extent are rivers drawn upon for existing supplies in this country?

To answer this question we must first define a river in this connection. It must of course be distinguished from those upland streams which afford some of the largest supplies in the country. An American writer has said of river supplies that "the water engineer must accept a certain amount of sewage pollution in river water, and make the best of it." This

is probably true of our river supplies properly so called, and it is proposed to define a river supply as "a supply drawn from the lower reaches of a stream, which has already received animal pollution." It follows then that in utilizing such supplies, not only is efficient and careful purification necessary, but pumping must in almost every case be resorted to.

A well-known authority, has stated that by far the larger proportion of the area of the country is supplied from underground sources, and if to this be added that considerable portion which is served from upland gathering grounds, it indicates that our rivers are not very generally drawn upon. In fact one has to think around to find a dozen cities or towns so supplied. The city of Exeter is so served.

It will be obvious to every water engineer that each case requires treatment on its merits, and that generally the locality will govern the class of supply that can be best adopted.

Devon has advantages, from a water supply as well as from other points of view, which are by no means general over the country. The counties of Devon and Cornwall, with portions of Somerset and Dorset, constitute the main drainage area of the river basins of this country. The peculiar characteristics of this area are: (1) that it contains the largest number of separate river basins of any of the great drainage areas; (2) the small area of such basins, which average only 103 square miles.

This means that we have in this peninsula a somewhat narrow tract of land, composed in the north and centre of high uplands, which quickly shed their water by means of short streams to the sea on either side. Add to this that the uplands are very sparsely populated, and we realise that we have an ideal physical conformation for the supply of water to the towns which lay on the coast, and it would seem that to allow the water which falls on these uplands to gravitate to low level, become polluted, and then pump it, is not a policy to be generally recommended, and, indeed, is one which has not generally been adopted here.

Doctor Adolf Kemna, who lately controlled the water supply to the city of Antwerp, contributed a paper to Volume XVII. of the Transactions of the Institute of Water Engineers, which should be read by all interested in the subject. Doctor Kemna is a well-known advocate of the principle that polluted river water if properly treated may safely be considered a suitable drinking supply, and those who have seen the unsavoury looking liquor which is treated at Antwerp, and within the area of a moderate sized works, converted into a translucent water, equal in appearance to the purest spring, and showing by all the well-known tests its dietetic

excellence, cannot fail to give him credit for having successfully solved the problem to which he has put his hand.

When, however, Doctor Kemna asks us to agree that "there is also another safeguard in connection with surface water supplies, namely, that being always open to contamination, they must be treated as if contaminated, and purification is absolutely essential," he is perhaps asking too much.

The limits of this short paper will not allow of a description of the various modern methods by which a polluted water may be made fit for a domestic supply, suffice it to say that in addition to the older method of sand filtration (which is by no means out of date or superseded, but rather scientifically improved), treatment by the following (but generally as adjuncts) are more or less commonly in use, viz.: 1, Ozone; 2, Chlorides of lime or potash; 3, Sulphate of alumina; 4, Ultra violet rays; 5, Lime.

In addition to these, it is only within recent years that the full effects of simple storage or decantation, in the reduction of bacteria in water, have been fully realised, and its useful office is being more extensively applied than formerly.

It has been the custom, to a great extent, among engineers and others, to consider all deep well waters and large springs as being suitable sources of supply without treatment and safe from pollution; but this attitude has of late years undergone a change: we have seen probably more epidemics of water-borne disease traced to the pollution of deep well waters and springs than have been caused by river water properly treated.

This is particularly the case where the wells or springs are in a fissured formation and in the vicinity of populated areas, and does not generally apply with the same force to springs rising at a considerable altitude. From these latter the author has provided supplies to a large number of rural areas by gravitation, and it is these that he recommends for use wherever possible, in the first place as being the most free from pollution.

When we come to consider the economic bearing of this question, another very good reason may be found in favour of these upland springs as a source of supply for our rural areas.

Pumping in millions of gallons per day is not comparatively a very expensive operation, but when we come to so deal with, say, 50,000 to 100,000 gallons per day, the cost is comparatively much higher.

An analysis of accounts of various water undertakings, compiled by Messrs. Wood, Drew & Co., Chartered Accountants, shows that the cost

of pumping, including coal, wages, and engine repairs, by the Metropolitan Water Board in 1910–11 was 0·82 of a penny per 1,000 gallons. Hull escapes with 0·37, Derby with 0·52, Croydon with 0·93, and it may be generally held that under favourable circumstances large supplies can be pumped to a reasonable elevation for well under a penny per 1,000 gallons. In the author's experience, supplemented by information from those in charge of similar works, the cost of pumping for supplies of 50,000 to 100,000 gallons per day averages not less than 2½d. per 1,000 gallons. This is equal to an annual charge of £190 in the first case or £380 in the latter. If the cost of the necessary engine house and machinery be added to the capitalised value of the latter sum, it will be seen that a sum sufficient to carry a 6-in. main for over 10 miles will result.

It was but a few years since an owner was willing to give a spring of water to supply an adjoining parish; to-day he generally requires some consideration, and often a substantial one. In dealing with the water supply of the future, the question must arise to whom does the water belong? It is submitted that the inhabitants of the natural drainage area have at least some claim to it, and that without paying unreasonable sums to both landowner and riparian owner. Both these, however, have interests that must be fairly considered, and it is high time that the respective interests of the various parties should be more clearly defined.

The author's suggestion of a policy is that, as regards those water-shed areas not yet appropriated, the upland springs should first be appropriated to the use of the dwellers in that river basin. Having regard to the probability of increased population or the needs of coast towns not yet sufficiently equipped for future needs, some help should be given from a central fund, where such is advisable, to enable mains to be laid large enough to convey not only the collected springs, but as occasion may require the whole of a large part of the surface yield of the collecting area.

Storage reservoirs and filters on the water-shed area might be added from time to time as may become necessary. This would obviate the difficulties commonly encountered from the fouling of trunk mains by vegetable growths due to the conveyance of unfiltered water.

The question arises whether our upland gathering areas will yield by springs sufficient water to make such a policy worthy of consideration. On this point a most interesting paper with local application by Mr. S. C. Chapman, water engineer of Torquay, published in Volume XV., 1910, of the Association of Water Engineers, may be consulted.

Mr. Chapman shows that from certain parts of the granite area of

Devonshire, a formation which is not highly permeable, the dry-weather flow (presumably the yield of springs) was as follows:—

	Cubic feet per second per 1,000 acres.
Torquay gathering ground	0·18
Plymouth „	1·06
Devonport „	0·66 to 0·93
The river Meavy was shown to yield ...	1·262

One cubic foot per second per 1,000 acres is equal to 344,000 gallons per square mile per day, or an average effective percolation of 8·6 inches of rainfall for the year.

An Old Red Sandstone area in Somerset of about five square miles, with which the author is well acquainted, yields by springs at least 200,000 gallons per square mile per day as a minimum, and supplies most of the towns and villages in the vicinity; this is equal to a percolation of about five inches per annum, but there is a good reason to think that a large quantity of spring water finds its way into the surrounding limestone and is lost.

A Greensand area of about two square miles yields by springs 300,000 gallons per square mile per day, equal to an effective percolation of seven and a half inches per annum.

This study of the minimum spring yield of upland gathering grounds may well be further followed, but it appears that from one square mile of suitable area at high level at least 5,000 persons may receive a pure spring water supply.

It is realised that no co-ordinating machinery at present exists to deal with a river basin on the comprehensive lines suggested, and as no paper on this subject can be considered complete without a passing reference to proposals (which are fast passing outside the realm of imaginative idealism) that the water supply of the country should be controlled by local committees in touch with some central body invested with considerable powers and acting in the interests of the general public, it is to be hoped with confidence that when such proposals take legislative form (and this seems likely to happen in the near future) the needs and financial limitations of our rural areas will receive the fullest consideration.

MR. A. J. MARTIN (Westminster) agreed that the difficulties, more particularly those of a financial nature, were often much greater in the case of a rural area than in that of a large urban population. In such a case there was often an advantage in grouping together a number of villages or small towns to carry

out a combined scheme. He had recently had to deal with a number of villages, situated on the Oxford Clay, a particularly hopeless formation from a water-bearing point of view. Water was ultimately brought a distance of sixteen or eighteen miles from a joint supply pumped from a deep well in the Greensand; and, in spite of the great distance, was supplied to the parishes concerned at a price of 4½d. or 5d. per 1,000 gallons.

Dr. Garrett (Cheltenham) said that he had had considerable experience with river-water for drinking purposes, as his town took a portion of its supply from the Severn. He had some years ago been called upon to make a report as to the suitability of Severn water for drinking purposes; and after examining samples of water from the Severn at many points, and finding that, notwithstanding every town on the Severn put its refuse waters into the river, the water of the river returned to its pristine condition of purity, both as regards organic matter and numbers of bacteria, within a very few miles of the point of pollution; and in consideration of the practical experience of a large number of towns, including London and Exeter, which are supplied in whole or in part from rivers, he had no difficulty in reporting that with careful treatment the Severn might be considered a safe source. With passing time and further experience it had been found that the original simple sand-filtration at first relied on might be very usefully assisted by other means, and he called attention to the great value of some kind of preliminary treatment by rapid filtration through coarse sand after addition to the water of certain chemical substances, such as sulphate of alumina and lime; and he particularly noted the great value of ordinary chloride of lime, which contained free caustic lime along with a proportion of calcium hypochlorite. The small quantity of free chlorine given up to the water by the latter had been shown to have extraordinary bactericidal powers, and was a most powerful assistant in rendering the water free of specific bacteria. Added to the water along with sulphate of alumina it was also effective in considerably diminishing the brown colour of water derived from peaty sources.

Mr. T. J. Moss-Flower (Westminster and Bristol) said if the central authority insisted on the various public bodies responsible for dealing with the sewage of their respective districts properly treating their sewage before discharging it into the rivers or channels communicating therewith, and the various water authorities adopted the means which were already at their disposal for purifying the water within the limits of any reasonable standard, water could be taken from a river at almost any point in its course to the sea, and thus the rivers could be looked upon as being a fruitful and economical source of water supply, and many of the difficulties which existed would then be solved.

He was not suggesting river-water-supplies as against other undoubted sources, but it was often a question of "Hobson's choice," and if it was possible

to obtain from a river a supply of water which could be made to satisfy all reasonable requirements, and it was not practicable, on account of cost or otherwise to obtain a supply from any other source, then it must be obtained from the river.

In one case where he had been consulted the only possible source was a river into which it was known sewage gained access two miles above the intake, and an analysis of the water at the point from which it was proposed to take a supply showed sewage contamination. The water was raised to a deposition reservoir and then passed through sand filters, all the latest devices being used. The result was a beautiful, clear, sparkling water which satisfied all reasonable standards.

In a second case, that of a large institution, and where it was believed the usual methods of filtration were unsuitable, the water was sterilised by means of a solution of chlorine, the efficiency of which, as a steriliser, Dr. Garrett had just eulogised. In that case a solution of hypochlorite of sodium was injected into the water as it passed up the rising main, the water then being passed through one of the Candy Filter Company's De-Clor filters. The result proved most satisfactory, the ordinary bacteria being reduced to very few per cc., and the *B. coli* not being discoverable in 100 cc. of the sterilised and filtered water. Prior to the introduction of the plant there had been a serious outbreak of diphtheria among the occupants of the institution. There had been no illness since the installation was put in some twelve months ago. These were given as two typical cases where polluted water had been made satisfactory by adopting present-day aids, and there was no justification for going long distances and incurring great expense when for a much smaller sum water could be made to satisfactorily meet all requirements.

MR. PHELPS said, in reply, that whilst he would be the last to suggest that cases did not arise where it might be necessary or expedient to collect, pump, dose, and filter river water which had become polluted, to render it fit for use, he thought that those who had spoken were not prepared to maintain that that was a policy to be generally adopted in preference to that he had outlined: 1. Because it must be preferable, from a sanitary point of view, to deal with unpolluted water rather than accept the risks incidental to breakdown of filters; 2. That it was certainly desirable to collect the spring water at high level, and take advantage of the natural force of gravity to supply high levels.

The Reclamation of the River Exe, from "The Point," Exmouth, to Lympstone, by SAMUEL HUTTON, Engineer and Surveyor, Exmouth Urban District Council.

ABSTRACT.

THE object of the paper is to bring forward the general question of reclamation in order to compensate for the areas lost for agricultural purposes by passing into building lands.

The case in point is the eastern bank of the estuary of the river Exe, between Exmouth and Lympstone, a length of about two miles.

Reclamation has been successfully carried out further eastwards during the past century, and some forty acres reclaimed about 1820, after being valuable grazing land for many years, has developed into a large urban building area with land, when filled up to a level for efficient drainage to sewers, that has realized over £700 per acre.

This area is now being rapidly covered with buildings, and the author thinks that a further scheme of reclamation might be undertaken.

The portion proposed to be dealt with would have an area of some 650 acres, and is in the parishes of Littleham, Withycombe Raleigh, and Lympstone.

To carry out the scheme the author proposes that a board or trust should be formed composed of representatives of the ratepayers of Exmouth and Lympstone, the owners concerned, the L. & S. W. Railway Company, Exmouth Dock Company, and the Exeter City Council as the navigation authority.

This board or trust should be granted powers by Act of Parliament to carry out the reclamation, raise funds for that purpose, have powers to dispose of the reclaimed land, and be responsible for the proper maintenance and control of the area reclaimed.

As regards the engineering side, the work should be carried out with such regard to economy, that within ten years of the reclamation the income derived from agricultural lettings would be sufficient to pay four per cent. on the capital laid down.

The method of enclosing proposed by the author is an embankment some two miles long, formed of clay hearting with dry filling and reinforced concrete slopes, and pitched roadway on the top ten feet wide.

The principal dimensions of the embankment would be as follows:—

Height above present level of mud flat	13	feet.
Width of embankment at foot	$42\frac{1}{2}$	„
„ „ „ „ top	10	„
Width of clay heart at bottom	30	„
„ „ top	9	„
Thickness of dry filling...	3	„

Thickness of reinforced concrete slope, 9 ins. with counterforts.
Sheet piling, 12 ins. × 6 ins., 9 feet below present level.

The cost of the embankment is estimated at £35,000 per mile, and with £10,000 for contingencies, would bring the total cost to £80,000, or £123 per acre.

The first four years after reclaiming would be devoted to warping a portion of the area, and this land would then be available as rich agricultural land, whilst a portion might be filled up for building purposes immediately.

The filling would be done by dredging the river opposite, and would cost about £300 per acre filled.

It is possible that the question of injury to navigation would arise on the following points:—Whether the works would alter the course of the river; whether the abstraction of 650 acres of water-covered area (at high water) would cause silting up of the channel to Turf.

The first point is perhaps open to argument, but the author thinks that no serious alteration would take place.

As to the second point, if silting up did occur, the dredging required for filling would keep the channel for many years, and the cost of dredging would easily be met out of the increased value of the filled land.

When the area of 650 acres was filled up, the question of the channel to Turf could be again considered.

Exmouth would then be a town of sufficient size and importance to be freed from the obligations of the Exeter Navigation Authority, and being a port authority of its own would be in a position to devote funds to keep the channel clear for the small vessels which can now be accommodated by the Exeter Canal. The scheme, though perhaps a little in advance of local opinion, is one that might be considered and possibly carried out with a reasonable hope of success.

MR. BRODIE (Blackpool) asked why, if the scheme were so financially sound, did not Exmouth take it in hand and make money on it? Reclamation at Morecombe Bay had not proved so profitable. It had usually ended up in the sea claiming its own again.

Mr. Munce (Belfast) suggested £100 per acre was more in the air than the land, and that Mr. Hutton would have to revise his estimates before putting them before the public.

Mr. Harbottle Reed (Exeter) asked if, from a sanitary point of view, it was desirable to build upon reclaimed marshes, as presumably the land was to be devoted to building sites in order to recoup the expense. With so much high ground in the immediate vicinity it did not appeal as a scheme for building land.

Mr. Gainsworthy (Exeter) asked what effect the scheme would have on the navigation of the Exe. A large volume of water would be shut off from the river passing in and out, and if that were done the bight and channels would shoal up. As to the embankment, the Warren, the natural breakwater, was washing away, and the embankment would have to stand the sea, and not simply the rise and fall of the swell.

The President of the Section (Mr. H. P. Boulnois) said the whole question was one of £ s. d. If the cost of the work made the land cost £123 per acre, and it could be sold at £150 per acre, the work might be worth doing. He believed there was no fear of the Warren being destroyed by the sea, unless some great convulsion of Nature took place. He knew that if the mud shore of the Exe could be done away with, it would be a great improvement to the appearance of the estuary at low water.

Mr. Hutton, in answer to Mr. Brodie, said that the conditions at Exmouth were very different from those at Blackpool, and if they had been similar he would have designed the embankment accordingly. He pointed out that an exactly similar slope outer defence, designed by him for Exmouth much nearer the open sea, had been approved without the slightest alteration. The design was on the Dutch principle, which he had closely studied during the past two years.

In reply to Mr. Harbottle Reed, he said that the area previously reclaimed was perhaps the healthiest in the town, showing a much less zymotic disease percentage than districts on the higher level.

In reply to Mr. Gainsworthy, Mr. Hutton said that Exeter was continually bringing the Warren bogey before Exmouth, but as engineer to the latter authority he could not advise his council to be drawn into the conference as to the protection of the Warren, the erosion of which was highly coloured. As to affecting the channel, he did not regard Exeter's navigation and sea-going trade as at all a serious matter, and it could be easily dealt with.

School Buildings and their Future. Opening of a Discussion by JAMES JERMAN, F.R.I.B.A., F.R.M.S.

THE intimation that important changes are pending in the administration of the education work of this country naturally arouses, in the minds of those who have to do with the provision of school buildings, thoughts of changes in methods and altered requirements.

SIZES OF CLASSROOMS.

The question of floor area per child has been selected as a topic for discussion, as the numbers to be accommodated in each class under one active teacher is a factor of immense importance in dealing with school planning.

The reduction in the number of children in the classes, in elementary schools especially, makes it difficult to cope with the varying conditions.

This is intensified by the growing desire to assemble all classes in individual classrooms, and to abandon the collection of several classes in main rooms imperfectly divided by curtains of various materials.

The comparatively small classes for secondary schools, and the still smaller classes for special classes, provide a reasonable and workable basis for planning, but the difficulty lies in the other schools where the bulk of our population have to be educated.

It is not a question, apparently, of how many children a competent teacher can effectively teach in a well-designed, lighted, warmed, and ventilated classroom, but rather how to cope with the varying numbers into which the head teacher finds it necessary to arrange the classes.

Can, therefore, the teacher be assisted in the future by designing the school building in such a way that he may allocate rooms to suit the sizes of the classes without entailing additional building?

By the present method of planning the head teacher has no opportunity of diminishing or enlarging classes for special work or teaching.

Instead of certain classes being permanently allocated to certain rooms, would it not be preferable to provide rooms of varying sizes for classes from 20 up to 60, and which classes might proceed to these rooms from wide corridors and verandahs without disturbing the school generally?

OUT-DOOR CLASSES.

The open-air tendency of the present generation demands that suitable accommodation should be provided, especially in country schools, for teaching in the open.

Positions of School Buildings.

In the past there has been a tendency to preserve or maintain sites close to the dwellings of the school children, the plea of convenience and accessibility being urged.

Surely on no grounds can this be defended; the outskirts of a town afford opportunities for acquiring larger sites at less cost, and reasonable outlook in selection appears to be all that is needed to properly place new buildings in the future.

Size of School Sites.

Without influencing to any material extent the cost of school buildings, a much larger and more shapely site would in the future enable the architect to spread his building to advantage and command a suitable aspect, not too near the boundaries.

It may be expected that future regulations will require much increased areas for sites, beyond that now stated.

This is suggested, having regard to the provision of workshops, cookery, and laundry classrooms, outdoor instruction and organised games, giving more ample opportunities for both paved and natural surfaces to the playgrounds, besides garden plots with their tool houses.

Sanitation.

Whilst ordinary sanitary arrangements are possible in most districts, there is still a lamentable want of water supply in too great a number of instances.

The provision of accommodation to give opportunity for the use of a bath, or simple forms of spray baths, should be possible in every school.

Meals.

Some accommodation should also be provided in the future for the numbers of children who, from force of circumstances, must remain over the dinner hour, and in many cases have not even the shelter of a playshed. The verandahs may offer some suitable accommodation, but a mess room would be more appropriate with opportunities for obtaining water in winter and summer.

The workman has already secured this privilege when engaged on building and engineering works, and is it too much to ask that the workmen's children should be equally afforded shelter and rest for their midday meal?

New Methods of Construction.

This offers a tempting subject for discussion, and in itself might provoke expressions of opinion covering a very large area.

The abolition of inaccessible spaces between floors and in roofs would be a gain, minimising risks of infection and more wholesome conditions.

Solid flat roofs, instead of the dust-gathering surfaces over porous plastered ceilings in the ordinary construction of slated and tiled roofs, would be welcomed as a provision in future regulations.

The want of a thoroughly sound, sanitary, durable jointless floor at a reasonable cost, suitable for the hard wear of our public schools, is much felt.

The entire prohibition of interior walls of uncovered brickwork, with their dust-collecting joints and uneven rough surfaces, however well coated, must give way to an impervious, hard, smooth cement material, and a glazed surface where there is any friction would appear to be a necessity for absolute cleanliness.

For the future there is not sufficient information available at present to predict the extent of the coming changes; it may, however, be regarded as probable that the cheapening of school buildings will not find favour, nor be found possible, if suitable provision is to be made for altered and increased educational methods; that more spacious accommodation will be desired, on the lines of the more generous area provided in American school buildings, and that the raising the age of school attendance, with continuity for after study, will obviously require a departure in the former recognised arrangements.

MR. PERCY MORRIS (Devon County Education Committee) said that in regard to the correlation of accommodation and cost in respect of the three types of schools mentioned in the paper, he thought they must not look for a common basis of comparison because they could not be considered collectively. The conditions which governed them were widely dissimilar, and the question, rightly or wrongly, was largely an economic one. If, however, they were dealt with individually, the difficulty to some extent disappeared, *e.g.*, the basis of comparison for elementary schools, that of cubical contents in relation to accommodation mentioned in the report of the Departmental Committee on the cost of School Buildings, supplied a useful test of economy of planning; and by going a step further and comparing the ratio of cubical contents below and above floor line, we had a means of determining, by a comparison of different schools, what part of the cost might be regarded as due to special circumstances of site, a material factor in those counties where level sites were almost unknown.

The difficulty of securing flexibility of working in elementary schools might to some extent be mitigated by a carefully compiled time-table, by the use for dual purposes of rooms allotted for special instruction, and perhaps by regarding the standard rather as a level of attainment to be reached by children

before promotion than as an inflexible unit for teaching purposes. He knew this view was keenly debated, but it nevertheless exercised considerable influence.

We ought to accept it as an axiom of school planning that every room in the building should be accessible without the disturbance of any other room in reaching it. As to the size of classrooms, in Devon they provided these to accommodate forty to forty-eight children, which gave flexibility where it was most needed at the top and bottom of the school. He advocated the use of narrow classrooms on the grounds of efficiency and economy. Their adoption improved lighting and ventilation, and reduced the angle of view from the teacher's desk. If a width of 20 feet was used for elementary school classrooms, a series of rooms, ascending by multiples of four the scale of accommodation, could be provided without loss of floor area and with a constant cubical area per head. This was not the case with wider rooms owing to the greater height required for lighting purposes. The former width did not require roof trusses.

The practice of teaching in the open air was becoming general; it was a subject dealt with in Sir George Newman's Annual Report for 1912, and there was little doubt that the possibility of throwing open the whole of one side of a classroom, upon suitable occasions, would have to be considered. In fact, this had already been accomplished in some instances. If it could be insured that all children came to school adequately clothed, properly fed and dry shod, it would go far to revolutionise our present system of school planning. Under these conditions it would be possible to teach in temporary shelters for nine months of the year.

He agreed with the principle of removing school sites from crowded districts, but pointed out that a recent Departmental Committee had considered the subject and reported that the difficulty of solution increased with its desirability.

Mr. D. Pugh-Jones (Glamorgan C.C.) pointed out that in addition to the elementary and secondary schools, his committee had recently erected a number of higher elementary schools, in which both science and art subjects were being taught in addition to the ordinary subjects. In these schools the sizes of classrooms were limited to holding forty, and this number, in his opinion, was large enough for a single teacher, and should fix the maximum size of a classroom.

As outdoor classes for a large portion of the year would be unsuitable in South Wales, to meet this difficulty all parts of all windows should be made to open so as to allow the maximum amount of fresh air and plenty of cross ventilation.

Covered play-sheds were always provided, and as many of the Glamorgan schools were erected on the hill-sides, large play-sheds were provided in the basement, facing south or south-east, which could be used for open-air classes during fine weather and on special occasions.

In populous districts, and in many cases even in rural districts, the education authorities had very little choice in the selection of sites, on account of the limited

amount of land and the monopoly of ownership; the cost, even then, of very poor and unsuitable sites was about £1,000 per acre for land previously let at a few shillings, and some sites not let at all, having no agricultural value, while the local education authority had in many instances to pay about £40 per acre per annum. Education authorities should be allowed by law to select the most suitable site in the locality at a reasonable cost, or on the rateable value, and in districts where the population rapidly increased, or was likely to, fairly large sites for future extensions, etc., should be acquired. As to baths, no doubt they should be provided in populous industrial and mining districts; but they would not be so necessary and would be rather expensive for small schools.

The Glamorgan County Council had provided for scholars to take their mid-day meals in a number of new schools. It was impossible to erect cheap permanent schools in Glamorgan, on account of cost of labour and materials, of the necessary precautionary measures to be taken against subsidence in mining districts, and of unsuitable and inaccessible sites. Often his committee was compelled to spend a large amount of money on roads, sewers, boundary walls, etc.

He had several schemes on hand for semi-temporary buildings of concrete-blocks, whilst for various reasons, temporary buildings had been erected in many places, often on account of the rapid increase of population.

He thought it unreasonable to defer the erection of permanent buildings because some change was likely to occur in the future, as the same reasons might be given when the change came about.

MR. W. H. MAY (Plymouth) asked what remedy the author suggested for the difficulty of providing adequate playground accommodation for schools in large towns. A large mixed school in a congested town area necessitated a building of three floors, the boys being on the top. He thought it was detrimental physically to the children to have to ascend these stairs often.

MR. J. OSBORNE SMITH (Westminster) regretted he could not approve the suggestion in the paper that small classrooms for twenty should be built; if smaller classes were made, as they would be in the future, a class for twenty or thirty occupying a room built for forty upon the ten feet floor space basis would be a natural improvement, by which a larger floor space would be secured for these special classes.

An obvious anomaly from a health point of view existed owing to the standard of floor space prescribed for secondary schools being nearly double that of the floor space for elementary schools, which meant that the more cleanly and better clothed children sat further apart in the classroom than those who were less favoured as to cleanliness and clothing. Similar conditions obtained in cloak-rooms. A room for twenty children on the ten feet basis would be too small for any reasonable purpose in connection with teaching; whereas a room for

forty on the same basis would be of dimensions suitable for any number below forty. As a sanitarian he regretted that there was not one standard of floor space for both kinds of schools.

He suggested that the cost of foundations of schools could be lessened in country and hilly districts by applying the principle of "lake dwellings," instead of the usual brickwork and concrete foundations.

Mr. Harbottle Reed (Exeter) observed that open-air schools being on the programme for discussion, he had hoped to have heard something of the advance made since 1908.

He referred to French casement windows, by which he noticed a large part of the sides of some schools in Geneva could be thrown open; also to the light folding portable desks used in Queen Marguerite's elementary school in Rome, where provision was also made not only for lantern lectures but for cinematograph pictures.

Mr. Jerman in reply admitted that the paper covered too much ground for ample discussion on each portion.

Referring to the restricted areas of city school playgrounds, he thought more advantage could be taken of public grounds in the vicinity. Mr. Reed had referred to the open-air schools seen in Rome, where climatic conditions favoured more freedom, and rendered the provision of regulation buildings less necessary.

The Architect's Grievance against the Model By-laws, by H. D. SEARLES-WOOD, F.R.I.B.A. (FELLOW).

SINCE Mr. Halsey Ricardo's paper, which was read at the York Congress and I think sufficiently answered, there have been papers read on the subject of the By-laws by Mr. William Woodward at the Surveyors' Institute and by Mr. Voysey at the British Constitutional Association. I thought it would be a useful subject to discuss the grievance referred to by these gentlemen, and the best remedy.

Mr. Woodward opens with an extract from "Little Dorrit," describing the Circumlocution Office, and says, "We still have with us the multitude of officials who don't know and know they don't know, and the others much more worrying who don't know and who don't know they don't know," and he proposes to abolish the Local Government Board as far as it concerns itself about buildings.

"A man who has been specially trained for the work must take the place of those who have had no practical experience whatever in bricks and mortar, and who only rely on theoretical text books and dozens of ill-drawn by-laws and regulations. But the mischief does not end here: an apparently oppressive Act of Parliament can be made reasonably workable by common sense administration, and an inoffensive measure may be rendered obstructive and vexatious by a faddy, ill-informed and naturally aggressive official."

Mr. Woodward quotes from a paper by Mr. Lacey W. Ridge read at the Royal Institute of British Architects in 1904: "Building by-laws specially in rural districts are oppressive and inconvenient to landowners and county gentlemen, without any corresponding advantage to themselves, their workmen, or their tenants. The deposit of drawings and the intimation that no building could be begun without the approval of the local authority were distinct causes of irritation. By-laws are enforced by officials unfit or unwilling to put any but the narrowest interpretation upon them; and that this conduct results in stopping building in the country, and, above all, is cutting off the supply of labourers' cottages."

On the same evening Mr. J. S. Gibson read a paper on architectural design and the London Building Act, in which he mentions the great desirability of all district surveyors being practising architects, observing that in the interpretation of the various regulations dealing with complex modern buildings it is essential to have men who are experienced in modern architectural practice, men who know the difficulties that are constantly arising, and who are intimately conversant with the schemes of architects

as judged by their designs. If architecture is to have any vitality in this country it can only be by sympathetic treatment at the hands of those carrying out the laws. Constant repression will discourage and enfeeble it, and above all red tape will strangle it. Nothing can be more inimical to the interests of the public, to the growth of architecture, to the beautifying of our streets, than to have as interpreters and administrators of a complex Building Act persons who, although highly skilled in technical knowledge and masters of routine, are inexperienced in the erection of buildings.

Sir Alexander Stenning read a paper at the Surveyors' Institute, in 1905, dealing with urban and rural by-laws. Referring to the deposit of plans, he says, "A district surveyor in London acting under the Building Act is satisfied with inspecting the drawings and pointing out to the builder any matter which he (the district surveyor) considers will contravene the provisions of the Act; but as 'district councils' have the power to demand the deposit of drawings, it gives them an opportunity of raising frivolous objections, as in the case of the Chorley Rural District Council (this is the case of the late Sir William Grantham)." The remedy for this, Sir Alexander Stenning sets forth in the following paragraph:—

> "It would be enough if notices were given to the authority by anyone intending to build, and a simple form for the purpose should be obtainable from the authorities, on which should be stated the class and exact position of the building intended to be erected, so that their inspector should have the opportunity of assuring himself that the by-laws as regards sanitation were not being infringed in any way, and whether or not it fell within the exemptions as regards construction and materials."

Mr. A. MacMorran, K.C., said the whole of the by-laws, from beginning to end, required revision; and more than that, they require revision by professional experts, by men who know where the shoe pinched.

Mr. L. G. Chiozza Money, M.P., in writing to the *Daily News* in November last, referred to the circular issued by the Local Government Board, and observed that:

> "It is high time that the matter of these by-laws was taken in hand and dealt with in such fashion as to prescribe for the country at large such rule as, while ensuring that no unhealthy dwelling shall be erected, shall not prevent the erection of a healthy dwelling at the lowest possible cost. As things are, we have a large part of the country under by-laws which vary very greatly in character, while we have many districts without any regulations whatever."

Mr. Woodward's remedy for this is to set up in each town an office (it may be the office of the architect or surveyor), which should be open every day at stated hours, for the examination of drawings and specifications for new dwellings for the working classes; it would not take an architect long to see that these drawings and specifications represented dwellings

which, for planning and specification, were suitable and proper, and would secure healthy dwellings.

To provide for the settlement of disputes a tribunal should be instituted in each town, before whom builders and architects should appear; the tribunal should consist of three men: one an architect, one a surveyor, and one a builder, each of good repute and of high standing; and the decision of this tribunal should be final and binding on all parties.

General rules and regulations must, of course, be made for the guidance of architects, builders, and tribunal of appeal. These would be compiled by professional men; would be about one-twentieth the length of the Local Government Board's by-laws, but all sufficient to secure healthy and well-built dwellings for the working classes, having in view the particulars, needs and requirements of each district both as regards materials and workmanship. For example, some districts are able to build economically in the particular materials at hand, whether wood, granite, stone, brick, etc. In a word, each building would be considered on its merits, and not tied down to a lot of regulations made compulsory on all builders whether applicable or not. In addition to these general rules and regulations, the constituted authorities would always have before them the future development of each district, the possibilities of extension and of tying-in between villages and towns and between towns and cities, lines of frontage, adequate air space, width of thoroughfare, heights of buildings, boundary walls and fences, sewers and drains, sanitary arrangements, and the formation and construction of roads and footways.

This formidable list at the end of his suggestions rather discounts Mr. Woodward's dream that the moment may arrive some day when all the districts in England may be without any regulations whatever.

So it all comes back to this, that whatever you call them, by-laws or regulations, it is impossible to go on without some guidance, and that leaves the two grievances of the administration of the law and the deposit of plans.

I venture to suggest that the feeling that appears to exist between architects and officials is due largely to want of knowledge on both sides. Many officials ask for absurd things to be done owing to the way in which they construe their by-laws, and many architects design their buildings without the slightest regard to the by-laws of the district, often not having taken the trouble to get a copy of them before designing the building; but I think that this friction is much less than it was. Officials are fast becoming better trained in their work, and approach the architect with much more sympathy, and architects are learning to respect the official who can so often help them over a difficulty.

Now with regard to the deposit of plans the real grievance is that the architects think that their plans are used for other purposes than seeing that the particular building complies with the by-laws, and that their designs are used by the officials in preparing drawings for their council's buildings. I have heard of instances where copies of plans have been obtained from the deposited plans, and houses built from them by unscrupulous builders.

Mr. Voysey, in a discussion on building by-laws, said some might think that building by-laws had no bearing whatever on character, but it was nevertheless the fact that what they saw must affect their minds, and through their minds, their character; the miles of hideous houses some of them had to pass every day depressed if they did not sour the temper, and those who were not consciously affected by them were at least affected in a negative way by losing the refining influence of what might be. The universal feeling that there was something wrong which might be put right, led no doubt to the creation of building by-laws, though war against ugliness as a moral evil was not the mainspring of the movement.

The tendency of by-laws was to discourage the introduction of any enlightened innovation by way of new methods of construction or the use of new materials.

The regulations affecting the height of rooms was by far the most harmful and far-reaching in its effect on building from an artistic point of view as well as from a practical and economic aspect. Not only councillors but architects in their zeal to advocate foreign styles in architecture, such as the Renaissance, had ignored all consideration of the English climate, the chief peculiarity of which was its variability. The constant changes to which their climate was subject made it very important that their houses should be constructed so as to preserve an equable temperature throughout the year.

The difficulty of securing this quality was greatly aggravated by high rooms, that was, rooms high in proportion to their size. The desire for high rooms was mainly due to the mistaken notion that they were necessarily more healthy, but Dr. Poore had laid it down that height alone did not make a room healthy, and if they were to have legislation to compel the construction of healthy rooms they needed provision for circulation of air, and not merely height of rooms. In England the windows should be kept as low as possible, compatible with abundance of light, so as to minimise the temperature-changing power of the glass surface, and the lower the ceiling the smaller the window might be without loss of light. Most rooms, whatever the size might be, should have the light from the windows diffused and reflected by the ceiling, and

separate from the smoke flue, but running up beside it as an exhaust. for the purpose of air circulation should have an air flue distinct and This additional flue added, of course, to the size of the chimney-stack, which was an artistic advantage, producing an effect of stability and dignity. It was true that it added to the cost of the building, but the cost was far more than counterbalanced by the reduction in the height of the rooms this made possible. If rooms might be built 7 ft. 6 in., or 7 ft. 9 in., or 8 ft. in height, the saving would be considerable on the thickness of the walls, the width of footings and foundations, the height of windows, the height of stairs, and the area occupied by the stairs and the walls. The regulation, which provided that the area of window should equal one-tenth of the floor area, was absurdly too great for small rooms and in no case ensured ventilation.

Mr. Voysey urged the abolition of the existing by-laws and the appointment in their stead of qualified officials, whose duty it should be to report to their council when any building was proposed that, in their opinion, would be dangerous to life, or would limit or infringe on the liberty of others. Then let it be made a criminal offence on the part of the owner of any building which could be shown to have caused injury. The owner, if made responsible, would be elevated and not degraded by his increased sense of responsibility.

The Royal Institute of British Architects report referred to by Mr. Woodward stated:—

> "It appears to the committee that no model by-laws can be considered complete which do not include those to be enforced by local authorities with respect to the staircase and exits of public buildings and factories, even though authorised otherwise than under the Public Health Acts.* It is of great importance that the requirements of the local authorities as to the deposit of drawings should be reasonable, and that they should be stated. The committee suggest that in all cases a block-plan, with the lines and depth of drainage shown thereon, together with the nearest public roadway and adjoining premises within 100 feet of the proposed building, should be deposited, and that when required plans and sections (together with elevations if needful to explain methods of construction) should be submitted for inspection during a definite and limited time, which drawings should be then returned stamped if approved, or if not approved accompanied by a precise statement of the particulars in which the by-laws have not been complied with. It would be of great advantage if an appeal could be provided to a technical authority as to the meaning and applicability of the by-law."

This report was presented in 1904, and the outcome of it was the modified model by-laws for rural districts, that closely followed the lines

* Model By-laws for means of escape in case of fire when less than 40 persons are employed, have recently been issued by the Local Government Board.

of the report; but nothing has been done in respect to the tribunal of appeal, and I suggest, in spite of Mr. Woodward and Mr. Voysey, that the best tribunal would be the Local Government Board.

In the event of a difference of opinion arising between the authority and the building owner as to the suitability of his design and the construction of the by-laws, the building owner should forward his drawings to the Local Government Board with a statement of the argument he put forward why the local authority should pass them, and the local authority should state their reasons for objecting; the decision of the Local Government Board should be binding on all parties, and, there should be no reason why the matter should not be dealt with promptly and with little trouble. I am aware that the Local Government Board always decline to give a legal interpretation, as that is a matter that the courts must settle; but this reference that I suggest would, in most cases, be as to the reasonableness of the objection, and would not necessarily involve the legal construction of the by-law, but simply the usual reading of it, with which the Local Government Board would be familiar.

It appears to me that such a tribunal would be more impartial than any tribunal formed in the way suggested by Mr. Woodward, and the decision of the Local Government Board would, in course of time, form a series of precedents which would be of great assistance to both local authorities and building owners.

The following Resolution was proposed by Mr. H. D. Searles-Wood:

> "That the Council of The Royal Sanitary Institute be requested to urge on the Local Government Board the desirability of the establishment by the Board of a tribunal of appeal from the decision of local authorities on points relating to practice in the working of the Building By-laws, and, should they consider that Parliamentary sanction is necessary for the formation of such a tribunal, to take steps to obtain such sanction."

Mr. G. William Lacey (Oswestry) said the grievance appeared from the paper to be not so much against the by-laws as against the officials who had to administer them, and although the quotations of other writers were somewhat objectionable, it appeared to him that Mr. Searles-Wood was much fairer in his criticisms and he was glad to hear the expression of his opinion. He failed to see why there should be any feeling of irritation on the part of architects in submitting plans to the local authority. It was laid down in law that the local authority were bound to express approval or otherwise, therefore, plans must be deposited. He could not see how the by-laws could have any restrictive effect on design, for if it had they would not have the magnificent public buildings they saw or the domestic architecture which was so much admired at the present time. Mr. Macmorran, who was a notable authority, had stated that the whole of the

by-laws required revision from beginning to end, and also that they required revision by professional experts who knew where the shoe pinched. But was not that going too far. When they came to consider the fundamentals of the by-laws were 9-inch external and party walls too thick, and were the laws governing the thickness of walls for various heights oppressive; was not the necessity for good foundations incontrovertible? Were the regulations for air space too liberal, or the method of drain construction too drastic? He thought no objection could be taken to these matters, but no doubt revision in some respects was required. He did not agree with Mr. Woodward, and to say that all regulations should be done away with was a debased form of socialism to which he thought very few would subscribe. Local government had rightly been placed in the hands of local authorities duly elected by the community, and they were the proper persons to study and guide the development of their districts. He did not like the suggestion that architects' plans were improperly utilised by public officials, and he thought as a class they were as conscientious in regard to their employers and the public as the architect to his client. Some of Mr. Searles-Wood's criticisms and suggestions were such as public officials would agree with. Mention had been made of hideous rows of houses in some streets, but that was not due to the by-laws, but rather to the desire from the speculative point of view to crowd houses together and to get as much profit as possible out of the land. With regard to Mr. Searles-Wood's resolution he thought there was something to be said in its favour, and he would rather welcome some such method of appeal on points of difference with regard to the by-laws, and would therefore second the resolution.

MR. EDWIN T. HALL (London) said the main objection to by-laws was that they were like cast iron, and by requiring buildings to be built of certain materials with walls of certain thickness, they tended to prevent new inventions from being applied. One speaker said a 9 in. hollow brick wall was not too thick, but why a brick wall and why 9 in.? Why not a 3 in. ferro-concrete wall? He had seen by-laws with dimensions for joists of overall span far in excess of any necessity, and the same as to sizes of soil-branches. By-laws should be framed on sufficiently broad lines to insure sanitation as to minimum air-space, area of rooms, light, weather-proofing, plumbing, and drainage. The main difficulty was that if by-laws in some districts were enforced, houses could not be erected to let at an economic rent of less than 4s. per week, which no poor man could pay. What they wanted were cottages which could be erected to let at 2s. or 2s. 6d. a week, and to that end invention should be encouraged. It was better to erect houses of any sound materials than to have none at all.

He therefore urged the revision of exacting by-laws, but meantime supported the resolution for the appointment of a tribunal of appeal, consisting of three experts (an architect, a surveyor, and a builder), with this variation that the tribunal should have the power to modify the by-laws in any case where the modification might be shown to be reasonable.

Mr. Kaye-Parry (Dublin) pointed out that as a rule the plans came before an engineer who had had no architectural training, and he looked at them with the eye of a civil engineer, and from his point of view took exception to things which the architect with his training considered quite legitimate, and would be able successfully to defend if permitted to do so. In Ireland they generally got over the difficulty by appealing from the surveyor to the council, and if they made a good case the council generally waived the by-laws. In Dublin, however, they had, in addition to the city surveyor, also a city architect, who was a Fellow of the Royal Institute of British Architects, and was a man for whom they had the greatest esteem. That gentleman reported on all plans sent in, and he approached the task with a sympathetic mind and with the desire to meet the architect in every way possible consistent with doing his duty. If they had a similar official in other places a great deal of the present friction would be overcome.

Mr. A. J. Redfern (Honiton) opposed the resolution as being unnecessary and wrong in principle. The paper, and also previous speakers' remarks, was a challenge and an insult to surveyors. Some seemed to think that only architects were capable of understanding buildings, and when in practice an architect so treated the local surveyor, the surveyor was bound to stand on his dignity.

He suggested that we should accept the present model rural by-laws. In his opinion these were simple enough, no height of rooms was given or light area, in fact none of the objections raised to-day applied to them; also large areas of the rural districts were at present without any by-laws. In his district, out of twenty-six parishes, only four had by-laws, so that the complaint fell to the ground completely as applied to the rural districts.

He desired to point out that the greater part of the plans sent in were from builders, not architects, and the surveyor must have his law fixed, and down in black and white, or jerry builders would give immense amount of trouble; these men would be the ones to take advantage of the tribunal of appeal, and not the genuine architect. In the majority of places there was not any difficulty at the present time, and if architects approached surveyors in a friendly way difficulties were not likely to arise.

Mr. T. P. H. Watkins (Pontypool), opposed the motion. As an administrator, and neither an architect nor building official, he considered the suggested process impracticable and inequitable. The reader admitted that the requirements of the local authority "must be stated" in black and white, and, the necessity of some by-laws being admitted, the effect of the resolution would be that the by-laws would be universally waived, or the men who could afford would appeal, and others being unable would have to comply because such an appeal would involve loss through some local enquiry and delay. By all means amend the by-laws to comply with modern ideas, but give the local authorities a minimum to be rigidly insisted upon. The power of compelling a revision of

by-laws was already in the hands of the Local Government Board under the Housing and Town Planning Act if authorities unjustifiably interfered with the provision of houses for the working classes, and no legislation was therefore needed.

MR. C. CHAMBERS SMITH (Westminster) complimented the author upon stating the case on behalf of architects in so reasonable a manner, which was in great contrast with some of the papers which had been read by architects before various institutions during the past twelve months. The readers of these papers and many London architects failed to recognise that the conditions in London were entirely different from those which obtained in provincial towns, where not more than one-third of the houses erected were from the plans or under the superintendence of qualified architects. They unfortunately appeared unable to realise that the speculative builder of the provinces gave the minimum of fitness for the maximum of profit to himself, even when by-laws were in force. What would happen where he had unrestricted scope for his ingenuity could not be well conceived. Yet some of them advocated the abolition of by-laws altogether on the pretext that by-laws "interfered with the liberty of the subject," and that "they are oppressive and inconvenient to landowners and country gentlemen."

But the health and safety of future occupiers of dwellings should have the first consideration, and architects might usefully co-operate with local authorities in devising means which should limit the mischief that such builders gave.

He considered, too, that the proposition put forward by Mr. Searles-Wood for a tribunal of appeal for owners, when local authorities refused to approve plans submitted to them under building by-laws, was not unreasonable, for it was well known that some local authorities on occasions did not act in regard to the administration of the by-laws in a judicial capacity. He preferred, however, that the resolution should ask for the Local Government Board to be the tribunal of appeal.

MR. H. PERCY BOULNOIS (London) said he was a surveyor for many years, and there was still confusion about this by-laws question. Many members of local authorities thought the by-laws were elastic, and that they could give way on them, but it was absolutely illegal to do anything of the kind. A by-law had to be enforced. The model by-laws themselves were over thirty years old, and were originally founded practically on the Great Fire of London, were aimed at the prevention of fire more than anything else, and in the interests of the fire insurance companies. The sooner someone could get to work to remodel the model by-laws, and to have the whole Acts of Parliament altered with regard to them, the better. A vast number of alterations in building had taken place since the laws were passed.

The Training of Engineers engaged on work associated with Sanitation,

by PROF. J. RADCLIFFE, M.Sc.Tech., F.R.Met.Soc. (FELLOW).

THE rapid development of science, or of knowledge arrived at by a series of close observations and experiments, has completely changed the rule of thumb methods of our predecessors. The introduction of scientific principles and the application of those principles to all matters relating to public health, have resulted in a reduction of the death rate in this and other countries far beyond the expectations of those who in the past made a special study of the conditions of life in town and country districts. Exclusive credit for the results obtained cannot be claimed by any class of persons, or by members of a single profession. Medical men, chemists, bacteriologists, engineers, architects, and members of the legal professions have all contributed to obtain the results which are tending to lengthen and strengthen the lives of individuals, and to establish conditions acceptable to all classes of the community. Finality in matters of this kind is impossible. Constant care and study is essential, so that advancement may be on right lines, and secured at a minimum expenditure of capital and labour. The general demand for increased efficiency, in respect of the engineers to be engaged on works associated with the improvement of the public health is steadily increasing, so that the professional engineer must now be able to perfect existing arrangements, and design appliances by which the reputation of English engineers for work associated with high-class sanitation may be maintained and increased. The field for the application of the knowledge and experience gained extends to all countries. Abroad, the demand for thoroughly trained men is steadily increasing, and at home greater care is exercised in selection when men are required for positions that at one time would have been filled by individuals having few qualifications relating to the duties of a municipal or sanitary engineer.

The training of engineers hitherto has been on general lines; and largely in accordance with the definition of the term Civil Engineer by Thomas Tredgold, Hon.M.Inst.C.E., in 1827, which, he held, included all branches of Engineering except Military Engineering. Further explanations were added by William Pole, F.R.S., M.Inst.C.E. (Hon. Sec.), in 1885. Since that time the enormous advances made in engineering matters have resulted in a division of the professional work described as civil engineering. Numerous and distinct sections have been formed, each controlled by specialists who devote their undivided attention to one particular branch of engineering, and we now have important independent

associations, such as the Mechanical, Electrical, Gas, and Municipal and Sanitary Engineers.

The following may be mentioned as distinct branches or sections of civil engineering: (*a*) canal and irrigation; (*b*) constructional work (including bridges and the use of steel and concrete for building purposes); (*c*) river, dock, and harbour; (*d*) electrical; (*e*) gas manufacture and appliances; (*f*) mechanical; (*g*) municipal and sanitary (including water supply, drainage, and street and road construction); (*h*) railway; (*i*) tramway. Many of the sections referred to have many important sub-divisions, as, for example, those of mechanical and electrical engineering.

The fundamental subjects applicable to all branches of the engineering profession are hydraulics, mechanics, strength and elasticity of materials, and theory of structures. The term "engineering science" has for convenience been used, as it is the province of engineering science to investigate the operation of physical laws under the complex conditions of practice. A sound knowledge of general mathematical methods is essential to the engineer; in practice he also requires the special scientific knowledge applicable to the section of engineering in which he may be engaged. The electrical engineer must know the laws which govern the application of electricity, and the engineer employed on work, associated with sanitation, for a municipality, or in private practice, must understand the principles of surveying and the general principles of hygiene, geology, chemistry, and bacteriology. It is not necessary that he should have the knowledge of a specialist in chemistry and bacteriology, but he will be expected to deal intelligently with reports relating to work he may have in hand by those who have made a special study of the subjects.

Specialisation is the demand of the age, and therefore our successors should be trained in a manner suitable to their special calling. The municipal engineer who has to deal with drainage, sewerage, sewage disposal, water supply, road and street construction and maintenance, the supervision of buildings and town planning is looked upon as an authority on all matters of a sanitary engineering character arising within his district, and he ought to possess knowledge which will justify, and enable him to give, reliable guidance and advice.

Engineers employed by local authorities, and those in private practice, have now recognised that a high standard of preliminary and general education (obtainable at the present time by all classes seeking entrance to the profession) is the foundation upon which to erect a superstructure of the right kind. A good general education of university matriculation

standard should be insisted upon as a condition of admission to an office. The Institute of Civil Engineers generally accept that standard as preliminary to studentship, provided additional mathematics has been taken.

The real professional training should be continuous, and extend over a period of at least four years; the first three years being a combined university and office course, and the fourth year either entirely devoted to the practical work of the office, or to a course combining post-graduate work at a university with the practical work of the office. Experience has shown that good results may be obtained by the latter arrangement, and that valuable credentials for use in after life may be secured by adopting that method. The university courses in engineering cover a net period of about six months in each year, and one month might be set aside for holiday; so that approximately five months may be spent under the eye of the engineer in the office, and in direct contact with practical work of an every-day character. Valuable experience may thus gradually be gained by the pupil, and his interest would extend beyond the walls of a university into the realities of his profession. Engineers cannot be entirely made at a university: as practical experience in the application of principles; contact with individuals, including contractors and their workmen; questions of estimated and actual cost; and the legal side of municipal and sanitary engineering work are obtainable only in the office of an engineer. On the other hand, office or works experience without systematic instruction of the right kind at an institution of university rank, will not satisfy the requirements of the present time; the demand of the future will undoubtedly be for a still higher standard. The great increase of knowledge, and the rapid progress of the last thirty years in matters relating to public health, are clear indications of the greater strain associated with the due preparation of the municipal and sanitary engineer of the future.

The combination of the university course with the actual work of the office has not received the consideration it deserves at the hands of those responsible for the training of engineers associated with sanitation.

The Corporation of the City of Manchester long ago recognised the importance of systematic training in municipal and sanitary engineering for the men engaged in the great enterprises concerned with the health and well being of the city, on the maintenance of which large sums of money are annually spent.

It is now engaged, for example, on a vast main drainage scheme to cost upwards of £1,000,000 sterling. The Corporation distributes water to the amount of more than 41,000,000 gallons daily to a population numbering upwards of 1,200,000.

The daily consumption of gas exceeds in summer 10,000,000 cubic feet,

and in winter 29,000,000 cubic feet, distributed through mains extending to 958 miles in length, embracing an area of 47½ square miles.

The length of single track tramway lines worked and owned by the Corporation extends to 127¾ miles, and of lines leased by it to 51¼, or a total of 185 miles. The passengers carried exceed 174,000,000 annually.

The supply of electricity by the Corporation is nearly 100,000,000 B.T. units per annum, distributed to 11,189 consumers, through 398 miles of main conductors.

These may serve as some examples of the municipal enterprise of a great city, in the very centre of a district, the population of which, forty miles from its Exchange as a centre, much exceeds that of London itself within the same radius; and further, as a practical illustration of the immense development that has taken place in the municipal and sanitary engineering branch of civil engineering, a development rivalling, if not exceeding, that of the other great branches of mechanical or electrical engineering.

All this vast expansion of municipal responsibility and enterprise, of which the foregoing are but a few examples out of many, indicates the necessity of securing highly trained and accomplished men for these important civic services.

The urban population is increasing from year to year, especially in the large industrial centres, and its preservation in effective health and strength presents a problem of the gravest character.

We have, moreover, to consider the amenities of life as well; and in our great industrial areas the question of smoke prevention and thus of securing more sunshine, so essential to healthy conditions not only of human but of vegetable life, falls well within the province of the municipal and sanitary engineer.

The source and causes of disease and of feeble health are becoming better understood; and since prevention is admittedly better than cure, the training and ultimately the appointment of men capable of grappling with and solving the difficult problems that arise become the chief duty of our municipal councils.

The importance of this training has been recognised, so far as sanitary engineering is concerned, in the arrangements of the Royal Charter granted in 1905, constituting the Victoria University of Manchester, which contains provisions for the establishment of a Faculty of Technology. In giving effect to these provisions, the Court of the University and the City Council mutually agreed to the inclusion in the Faculty of certain departments of the Municipal School of Technology, one of which departments was that described in the Calendar as Municipal and Sanitary

Engineering. Students of the department are therefore now prepared, certain preliminary conditions being complied with, for the degree of Bachelor of Technical Science (B.Sc.Tech.), or that of Master of Technical Science (M.Sc.Tech.), and may proceed to the degree of D.Sc.

The course leading to the degree of B.Sc.Tech. in *Sanitary Engineering* includes Drainage and Sanitary Appliances, Sewerage and Sewage Disposal, Road Construction, Hydraulics and Water Supply, and the Chemical examination of Water and Sewage. The course further includes the Theory of Structures, Principles of Building Construction and Ventilation, Surveying and Levelling, Properties, Strength and Testing of Materials, and the study of the Sciences (including Mathematics) directly applicable to Municipaland Sanitary Engineering.

The course covers three years, and may be extended for special research to a fourth year. The Corporation award valuable scholarships in connection with this part of the training.

The value of actual contact with the everyday work of the engineer has not been overlooked. Various kinds of works in course of construction and under ordinary working conditions are visited, and the explanations of the engineers in charge always prove very acceptable to the students. At the present time, seventeen students of municipal and sanitary engineering from the Manchester School of Technology in charge of two fully-qualified instructors are housed in three tents near Hellifield (on the Midland Railway, 50 miles from Manchester). They are engaged on an intricate survey of river and farm land of about 200 acres in extent. The work done in the field will be completed by each of the students when they return to Manchester.

The study of meteorology and its application to questions of water supply, drainage, and sewerage also receive practical attention.

The attendance and interest shown at the recent International Road Congress is sufficient evidence of the enormous amount of attention that is now given to the efficiency of road and street construction; and the time occupied in obtaining evidence and experience by the members of the Royal Commission appointed to inquire into the question of sewage disposal is sufficient indication of the complex nature of that section of municipal and sanitary engineering. These are only two of the many parts of that branch of civil engineering, but they are sufficient to justify special arrangements for training engineers who intend to devote their energies to the general improvement of our streets and roads, as well as for those to be engaged in the treatment and disposal of waste matters and sewage, which are so largely concerned with the conservation of the public health.

Briefly, the training may be divided into four parts: (*a*) general education; (*b*) a sound knowledge of the fundamental principles of engineering; (*c*) specialisation; (*d*) practical experience.

Members of professional institutions should encourage measures for the better training of future members, and give them the benefit of their experience and assistance; but there is one side of the question which should not be omitted from a paper of this kind, namely, the admission of pupils to the offices of engineers. The offices may be divided into three classes: those of civil engineers in private practice who make a speciality of municipal and sanitary engineering work; firms in private practice who also hold public appointments; and engineers who devote their whole time to the service of local authorities. No difficulties regarding admission exist when vacancies occur in the first-named two cases, or even in the last mentioned when the engineer is allowed to take pupils into his office. Many local authorities do not offer facilities for the future members of the profession to acquire practical experience, and the scheme for giving a University training, combined with office experience, to such men is, therefore, not possible in such cases. Many of the local authorities referred to carry out an enormous amount of valuable work of a highly technical character, so that it is a serious loss to the profession, and to the public generally, when young engineers cannot receive a sound training and gain experience by entering the public service under the tutelage of the chief engineers of the authorities, who have in hand the design and execution of measures dealing with the maintenance of the public health. Surely some arrangement should be possible to overcome the difficulty, and thus add to the efficiency of the scheme for the education of engineers. The local authorities would have the services of the pupil, and the pupil would have the advantages resulting from constant contact with good office routine, and with work of an extensive and important character under the guidance of the chief engineer, who would be paid for this important personal service by the pupil. All interested would benefit by the adoption of a wider policy for the training of the municipal and sanitary engineers of the future. Local authorities are, I believe, generally more willing to assist than desirous of retarding the efforts of individuals to improve the standing and reputation of those who endeavour to acquire knowledge of a practical character, and for the benefit of the public I would appeal to them to give these necessary facilities. The appointment of public officials on the results of examinations may, perhaps, have some disadvantages; but they at least satisfy one condition, in that they remove the difficulties often experienced by officials and members of municipal councils who are sometimes pressed to give preference to applicants who are friends of interested parties. The whole

matter is deserving of careful consideration by those who desire efficiency in engineering as applied to the public health.

Mr. H. D. Searles-Wood (London) said, as an examiner for the Civil Service Commission and other bodies, he had found the candidates had a singular lack of intuition, and, if it were possible, a training in common sense would be of the greatest value, and training in the offices of the Public Service might give this.

Mr. Baker (Portsmouth) said he did not speak as an engineer but as an engineer's man. He had held positions of trust on public works under engineers, civil and military, and had opportunities of observing how young men behaved under their pupilage.

Whatever class of schooling the young man may have had, the fact remained that there still existed the office, workshop and works, and if he carefully noticed, while going through these sections, the modern works and the workaday life, he would get on in the world.

Mr. A. P. I. Cotterell (Westminster) said that during the last few years he had practically discontinued taking premiated pupils, and had only admitted, without premium, those who had previously matriculated at the University, and in some instances had obtained the B.Sc. degree. The results, so far as he was concerned, were most satisfactory. The men had come in after some years' previous theoretical training, keen to make headway in their profession and willing to work hard. They had spent the period required by the Institution of Civil Engineers for qualification, after which they were capable of being advanced; but from almost the first entry he was able to treat them, as compared with previous entrants, less like pupils and more like assistants.

Professor Radcliffe said, in reply, he entirely agreed with the remarks of Mr. Searles-Wood, but he believed that much might be accomplished in that direction by allowing students at colleges, offices, and works to more fully exercise their own ideas instead of following hard and fast lines without variation. That method of training had a tendency to make machines of men.

The introduction of chemistry into the engineering courses had been a success in Manchester. Engineers associated with sanitation cannot make real headway without a knowledge of chemistry, but great care has to be exercised to provide for senior students, instruction in chemistry of the right kind, having a bearing directly on the work of the engineer. The Government of India fully recognises the value of practical training for engineers, and offers facilities for young engineers to obtain experience on their public works.

He earnestly appealed to engineers and to the local authorities of this country to extend the arrangements by which young engineers associated with sanitation may be able to gain practical experience by contact with public works, generally carried out at considerable cost to the ratepayers of town and country districts.

Volume XXXIV. No. 10. **Issued November, 1913.**

JOURNAL

OF

THE ROYAL SANITARY INSTITUTE

CONGRESS AT EXETER.

Section B.—Engineering and Architecture (continued.)

On the Disposal of the Sewage from the Districts situated at or near the Coast of the Bristol Channel from the River Usk to Lavernock Point, by E. A. Letts, D.Sc., etc. (Fellow).

THIS subject should be of considerable interest from both the engineering and chemical points of view, and chiefly for the following reasons:—

1. As a whole, the population of the district is dense, owing to its being one of the chief coal mining centres of Great Britain, and because of the numerous steel, tin-plate and galvanising works in the neighbourhood.

2. On account of the somewhat unusual enterprise, which has been shown by certain communities, in the construction, at very considerable expense, of long trunk sewers, which discharge their contents directly into the Bristol Channel. The trunk sewers so discharging are the Cardiff main sewer, and the Rhondda and Western Valleys sewers, while that for the Rhymney Valley is now in course of construction.

3. The peculiar features of this part of the coast and waters of the Bristol Channel, which renders them peculiarly fitted for sewage outfall works and the satisfactory disposal of large volumes of sewage.

The Waters and Foreshore of the Bristol Channel, from the Mouth of the Usk to Lavernock Point.

Some time ago the author had occasion to examine a few samples both of the water and of the bed of the Channel along a part of this track (which, as the crow flies, is about twelve miles in length), and also to

Locality.	Population.		Drainage Area.	Length of Trunk Sewer	Point of Discharge.	Hour of Discharge.
	Present.	Provided for.				
Cardiff (W. Outfall) ...	64,000	200,000	......	......	Lavernock Point.	1 hr. before H. W. to 3 hrs. after "
Rhondda Valley	......	......	50 Sq. miles	17 miles.	1 mile East of River Rhymney.	No restriction.
Rhymney Valley	90,000 to 100,000	180,000	52 Sq. miles.	26 miles.	1⅓ miles East of River Rhymney.	2 hrs. before H. W. to 2 hrs. after "
Western Valleys	Over 150,000	200,000	74 Sq. miles.	50 miles.	About 2 miles West of mouth of R. Usk.	2½ hrs. before H. W. to half ebb.
Newport	About 84,000	......	......	......	River Usk.	No restriction.
Eastern Valleys	About 60,000	85,00)	41 Sq. miles.	Pill Mawr Scheme, about 13½ miles. Ponthier Scheme, about 14 miles.	River Usk. Afon Lwyd.	....

Locality.	Date of Opening of Sewer.
Cardiff	1910
Rhondda Valley	1911
Rhymney Valleys	In course of construction.
Newport	1856—1860
Eastern Valleys	...

inspect parts of the foreshore, and more especially those from Lavernock Point to Penarth, the immediate neighbourhood of Cardiff, the neighbourhood of St. Mellons (where he walked out over the mud at low water as far as possible); while he inspected (from a tug) the Western Valleys and the Rhondda Valley outfalls.

The Foreshore.

There are remarkable differences between those parts of the foreshore which extend from the Usk to Penarth on the one hand, and from thence to Lavernock Point on the other. The former consists of a bleak, muddy waste about ten miles long, and varying in width at low water from about half a mile to a mile. The mud or clay of which it is composed is often deep and very tenacious, so that examining it on foot is by no means an agreeable occupation. Its use, therefore, by the neighbouring extensive populations for recreative purposes, such as walking or bathing, need not be considered.

Behind the foreshore are low-lying meadows with relatively few houses, except, of course, in the neighbourhood of Cardiff; the soil of these meadows is also to a large extent clay, and therefore of an unattractive nature in wet weather, so that in their case also pleasures such as walking, golfing, or the playing of other games are often impossible, and to the best of the author's belief are not indulged in. Broadly speaking, therefore, neither the foreshore nor the ground bordering it presents inducements to the ordinary person to visit them.

The author was impressed when visiting this locality with the great differences between it and the usual type of seaside resort, with a clean rocky or sandy foreshore and a backing of either cliffs or meadows.

If unsuited for purposes of recreation, the foreshore in question is admirably adapted for outfall sites, its width securing that the sewage from the sewer outfalls (if the latter are properly situated, as appears to be the case), and if discharged at suitable hours (which also appears to be done), it seemed to him that the tides ought to be sufficiently strong to rapidly dilute and satisfactorily dispose of the escaping sewage.

From Penarth to Lavernock Point the conditions are, in one way, completely different, the mud of the foreshore being here replaced by a rocky or stony bed, from which the tide ebbs, relatively speaking, only a short distance, and the shore itself is at the base of cliffs. Penarth, therefore, is a pleasure resort of some reputation. It should also be mentioned that seaweeds (practically absent from the foreshore between the Usk and Cardiff) are to be found fairly plentifully on this stretch

of foreshore, and it was of interest to the author to notice the green seaweed, *Ulva latissima*, in some amount on the rocks near Lavernock Point. The occurrence of this seaweed so close to the Cardiff main outfall is significant, though the nature of the foreshore precludes the possibility of its ever causing a nuisance.

The waters of the Bristol Channel (within the limits mentioned).

In all six samples were collected and examined from the following localities and under the conditions named, all being collected from a tug:—

(*a*) Off St. Mellons (site of Rhymney Valley outfall): three samples. The first at two hours before high water; the second at one hour before high water; and the third two hours after high water.

(*b*) At a distance of 200 yards from the Western Valleys outfall: one sample. One hour after high water and in the track of the sewage flow which, by special permission, was then being discharged.

(*c*) Two samples, both taken 100 yards from the Rhondda Valley outfall. At three and three and a half hours respectively after high water. These were also collected when sewage was being discharged from the outfall, and in its track.

From the chlorine content of these samples it was calculated that they contained amounts of ocean water varying from 55–47 per cent. by volume; varying, of course, with the state of the tide.

The quantity of dissolved oxygen contained originally in all the samples was determined at the time of collection, and all were found to be well saturated with that gas, the amount varying from 96–92 per cent. of that required theoretically for saturation in the cases of mixtures of ocean and fresh water of the given proportions, and at the temperature of the water at the time of collecting each sample.

All the samples behaved in much the same way on keeping them in full bottles (well stoppered during the period of keeping), which latter varied from 6–9 days: the temperature during that period being that of the laboratory. The greatest loss was about 13 per cent. of the oxygen originally present (7 days' keeping) and the least 9 per cent.

It is somewhat remarkable that the greatest loss occurred in the second sample collected off St. Mellons (one hour before high water), where there is at present no discharge of sewage. Possibly, this may have been due to the tide having brought back diluted sewage from one of the outfalls further down the coast. Regarding the nitrogen as free ammonia (which, in the absence of one which is more reliable, is usually regarded as the chemical index of sewage pollution), the amount varied from ·027 part per

100,000 (in the sample just mentioned as losing most dissolved oxygen) to less than half that amount, namely, ·012, in the sample collected off the Rhondda Valley outfall 3½ hours after high water. A sample of the Western Valleys sewage (kindly obtained for me by Mr. Alford) was found on analysis to contain 2 parts of nitrogen as ammonia per 100,000, a figure practically identical with that obtained by the author for the Belfast sewage, as the mean of daily analyses extending over a twelvemonth. The sample of water collected 200 yards from the Western Valleys outfall during its discharge, and in the track of the sewage flow, contained ·02, corresponding therefore with a dilution of 100, supposing that the diluting water itself contained originally *no* free ammonia, or a dilution of 200 supposing that the diluting water contained ·01, which was the lowest figure obtained in any of the samples: this particular one having been collected off St. Mellons 2 hours before high water, and about 1½ miles from the Rhondda outfall, which was the nearest outfall. It would thus appear from the chemical examination of these water samples that the dilution of the sewage, even quite close to the two existing outfalls, namely, those of the Rhondda and Western Valleys, is amply sufficient for efficient disposal, and the same remark doubtless applies to the Cardiff main or western outfall, and will in all probability apply to that of the Rhymney Valley when it is completed and in action.

Improvements are desirable in the case of the outfall which discharges directly on to the foreshore on the eastern side of Cardiff, and also in that of one at least of the Penarth outfalls which discharges in a similar manner.

THE BED OF THE FORESHORE FROM THE OUTFALL OF THE RHONDDA VALLEY SEWER TO THAT OF THE WESTERN VALLEYS.

The author has pointed out, in work done for the Royal Commission on Sewage Disposal,* that information of some importance in relation to the efficiency or non-efficiency of sewage disposal into a water course, can be obtained from a chemical examination of the material of which the bed of the latter is composed in the neighbourhood of the outfall.

If the currents are sufficiently rapid, the sewage solids are swept away to some distance, and are either deposited in such small quantities as to ensure rapid oxidation, or so far away that their recognition by chemical tests is virtually impossible.

On the other hand, failing sufficiently rapid currents, the sewage-solids are deposited *near* the outfall, and may be recognised as follows:—

* Appendix VI. to Fifth Report, p. 225–226.

1. *First and best, by the percentage of nitrogen which they contain in the dry state.*—He found an average of practically 2·5 per cent. nitrogen in the dried solids separating from the (screened) sewage of Belfast, as the result of a series of daily analyses, made during a complete year, and no doubt a figure not sufficiently different to be of importance would be found for the solids of other sewages from fairly large communities.

Hence it follows that if what may be termed the normal amount of nitrogen present in the bed of a stream be known, or, in other words, the amount in the unpolluted parts of its bed, the percentage of sewage solids can be calculated from the nitrogen content of a given sample.

Five samples of the bed of the foreshore were collected and examined; two of these were obtained by hand at low water, and the others by means of a dredge. The localities were:—

(*a*) 100 yards from the Rhondda Valley outfall, and in the track of the sewage flow. (*b*) Off St. Mellons (opposite site of proposed Rhymney Valley outfall): one sample about 250 yards from the shore; one at the edge of the water (low tide, neap); and a third a little bit further out (actual site of proposed Rhymney Valley outfall). (*c*) 200 yards from the Western Valleys outfall, and in the track of the sewage flow.

These contained between ·14 and ·15 per cent. of nitrogen in the dried samples, with the exception of the third sample collected off St. Mellons and furthest seawards, which contained about one-fourth of that amount, ·036. Supposing the latter to represent the normal amount of nitrogen in the (dry) foreshore bed, the highest pollution by sewage solids amounted to 4·6 per cent.* in the sample collected 100 yards from the Rhondda Valley outfall, and 4·4 per cent. in the sample collected 200 yards from the Western Valleys outfall, both being inconsiderable amounts.

The author is inclined to believe, however, that the normal amount of nitrogen in the foreshore mud is higher than ·036 and approaches ·14, as this last quantity was found in the first two samples collected off St. Mellons, where at present there is no pollution by sewage to speak of, and if ·14 is the normal content of the unpolluted mud, the pollution even close to the two outfalls named is inconsiderable, and would be only a fraction per cent.

The other two methods for tracing the amount of organic impurities in the bed of a stream, the author regards as not being so reliable, at least in relation to sewage pollution, as they indicate merely organic matter, and do not distinguish between such as is of vegetable and of animal origin. They are:—

2. *The behaviour of the solids when heated.*—Under these conditions

* Arrived at thus: 2·5 : 100 :: (·152—·036).

polluted samples (*a*) blacken, and (*b*) emit visible vapours, while (*c*) they lose weight in proportion to the amount of organic pollution.

3. *By their behaviour on keeping at ordinary temperature in closed vessels.*—Under these conditions polluted samples blacken, while if unpolluted, they do not change colour. By mistake none of the samples in question were submitted to this test, but were at once dried for examination by (1) and (2).

Regarding the latter the greatest loss on heating was in the sample collected 100 yards from the Rhondda Valley outfall (12·2 per cent.), while the next was in the sample collected furthest off the shore at St. Mellons (10·2 per cent.) Both of these samples blackened only slightly on heating and emitted only slight visible vapours.

The author regrets that his opportunities for examining the bed of the foreshore in this locality were limited, but he believes that the few analyses made, indicate with enough clearness that the tidal currents are sufficiently rapid to effectually disperse the sewage solids from the existing outfalls, and thus to deal with them in a perfectly satisfactory manner.

The River Usk.

This river is chiefly of interest in relation to the subject of this paper for the following reasons:—

1. It already receives the sewage of the town of Newport.
2. In both of the schemes which have been proposed for the disposal of the sewage of the so-called Eastern Valleys, virtually the valley of the Afon Lwyd river a tributary of the Usk, the effluent will eventually enter the Usk.
3. The salmon fisheries of the Usk are of some importance, and the conservators have shown great vigilance in relation to the proposed outfalls of the two rival schemes for the sewerage of the Eastern Valleys, with reference to their possible effects on the conservators' interests.

The author, along with his colleague Dr. Adeney, visited the Usk in the summer of 1904 on behalf of the Royal Commission on Sewage Disposal, spending two days in inspecting and, as far as possible, investigating its water. They again examined part of the river in 1911, on behalf of the promoters of the Pill Mawr scheme for the sewerage of the Eastern Valleys, and made a more searching examination of the waters of the Usk at Pill Mawr.

The following topographical particulars may be of interest in relation to that river. Rising near the eastern boundary of Carmarthenshire, its length is about 72 miles, of which some 16 are tidal. Its width at Newport is about 1,000 feet, and the tidal rise and fall there amounts to about 38

feet at extreme spring tides. As a consequence, the tidal currents are rapid, and the river to a large extent is emptied at each tide.

The Usk in its tidal reaches is remarkably muddy, its banks consisting of mud to a depth of some feet, while at certain states of the tide the amount of solids in suspension is extraordinary, the author having found as much as 1·2 per cent. of these (dry) in a sample of the water collected rather over a mile above Newport at half ebb on a spring tide.

There is a very small population in the Usk watershed and that at long intervals, so that its influence on the lower reaches of the river is negligible, as was indeed shown by an analysis of the water some distance above Caerleon in 1904, which gave mere traces of free ammonia.

But such is not the case with the Afon Lwyd, which enters the Usk some five miles above Newport (but below the point from which the sample was collected for the analysis just referred to), and which has been described as follows:—"One of the main tributaries of the Usk, which joins the river at Caerleon, and which has various tin-plate and other works and collieries on its banks, is little better than a huge sewer. No attempt is made by the various urban and district councils to deal with the sewage which flows into the river. Most of the works make some attempt to filter or otherwise reduce the acid coming from the works, and the owners of collieries also to a certain extent reduce the large amount of coal washings which used to flow direct into the river."*

The determinations made by the author and Dr. Adeney in 1904 were of dissolved oxygen and chlorine in the water at different parts of the river, the latter being made with the object of ascertaining the proportions of sea and fresh water, while Dr. Howard Jones, the medical officer of health for Newport, was so good as to determine nitrogen in the same samples as free ammonia, albuminoid ammonia, and nitrates. As the results of these different determinations are discussed fully in Appendix VI. to the Fifth Report of the Royal Commission on Sewage Disposal, which volume was written by the author and Dr. Adeney, and deals with the "Pollution of Estuaries and Tidal Waters," it is not necessary to refer to them further.

Eastern Valleys Sewerage Schemes.—Attention has already been drawn to the condition of the Afon Lwyd, which drains the so-called "Eastern Valleys" of this district, which is thickly populated, the number of inhabitants amounting to about 60,000. The district is largely industrial in character, being in the eastern part of the South Wales coalfield. Having carefully inspected the stream in question on more than one

* Royal Commission on Salmon Fisheries Report. Part III. Appendix, Section I., p. 182.

occasion, the author is inclined to agree with the description given of it by the witness before the Royal Commission on Salmon Fisheries, as "little better than a huge sewer." This stream rises near Blaenavon, a distance, as the crow flies, of about thirteen miles from its junction with the Usk, near Caerleon. During its flow it passes through Abersychan, Pontypool, Panteg, Llanfrechfa Upper, and Llantarnam urban districts.

In the year 1910, the County Council of Monmouthshire decided that the existing conditions with regard to the sewerage of this district could no longer be tolerated, and that immediate action was imperative.

Eventually two rival schemes were proposed, called respectively those of Pill Mawr and Ponthir. Both involved the construction of a trunk sewer down the greater part of the valley of the Afon Lwyd, but whereas in the first it was proposed merely to submit the sewage to a process of sedimentation and to discharge the clarified effluent into the Usk at Pill Mawr, the second was of a much more expensive nature, and involved a complete scheme of bacterial treatment and a different point of discharge for the effluent, namely, at Ponthir, and not directly into the Usk, but into the Afon Lwyd, that stream entering the Usk near Caerlon, Ponthir being upwards of a mile (by river) above the point of junction of the two streams.

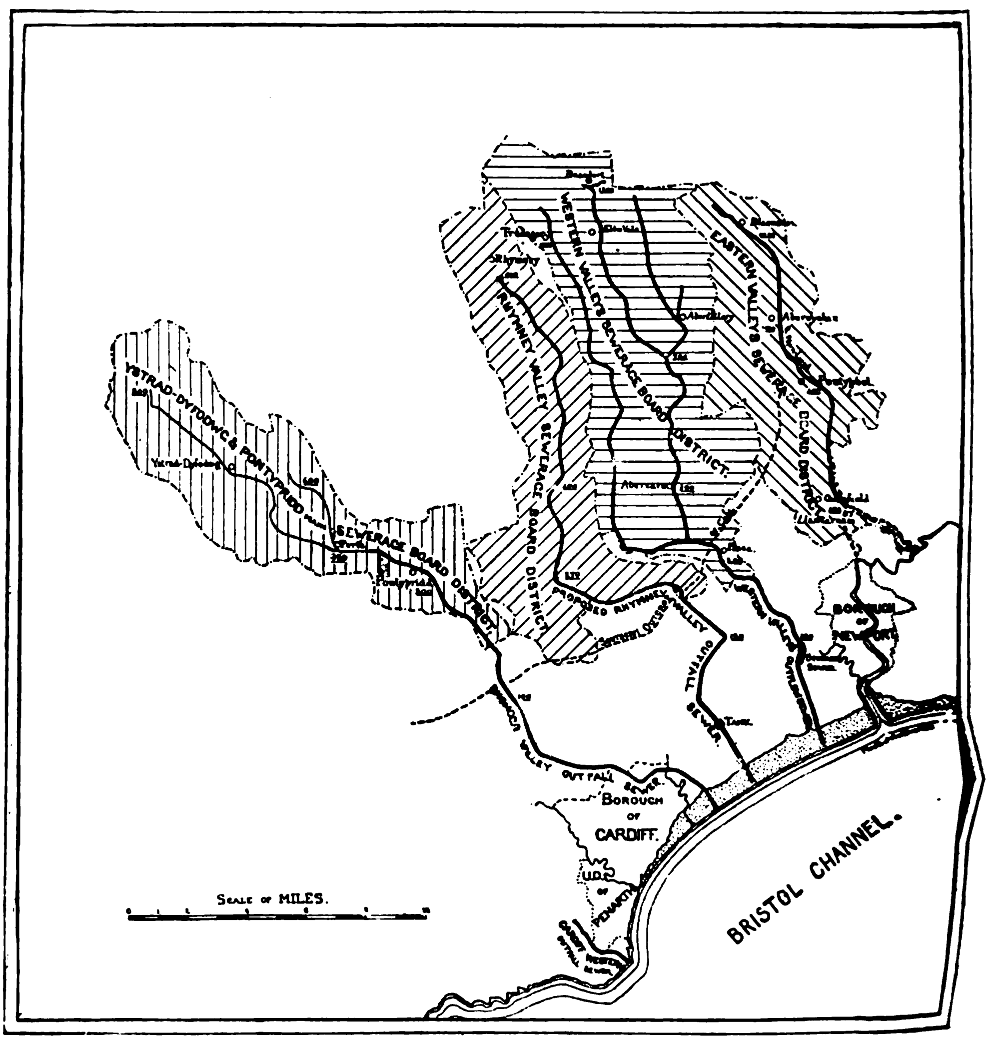
Both schemes found energetic supporters among the populations concerned, and were embodied in two separate Bills, which, however, were withdrawn before Committee, the Local Government Board being of opinion that the matter should be settled by Provisional Order, and refusing its sanction to the promotion of the Bills as required by the Borough Funds Acts.

No useful purpose would be served by giving a detailed account of the subsequent proceedings in this matter, but it may be mentioned that the Local Government Board held a Conference in March, 1911, at Pontypool, at which the different experts in the rival schemes were invited to state their opinions and arguments at length, and were cross-examined.

Eventually, in 1912, a Provisional Order was passed which constitutes all the Urban Councils in the Valley a joint authority under the name of the "Eastern Valleys (Monmouthshire) Joint Sewerage Board," but the whole of the executive powers were cut out in the House of Lords, and a clause inserted authorising the joint Board to proceed only by Bill or Provisional Order.

It would not be seemly nor advisable for the author, as one of those who has been in the service of the promoters of the Pill Mawr scheme, to enter into any particulars of his investigations, but he sees no reason why

he should not state the broad grounds on which he arrived at the conclusion that the sewage of the Eastern Valleys might be discharged with perfect safety into the Usk at Pill Mawr (on the ebb tide) if sufficiently sedimented; and that any further treatment would involve a waste of public money to the extent, he is informed, of about £50,000, including the capitalisation of the additional cost of maintenance of full purification plant, or equal to 15s. per head of the population ultimately provided for, that being the difference in the cost of the two schemes.



1. The engineers are satisfied that the average minimum dilution of the sewage, as between spring and neap tides by the river water, even allowing for 25 per cent. increase of population, will be upwards of 1,000 times; and as the Usk is a rapid river in its tidal reaches, the diluted sewage will proceed quickly towards the Bristol Channel, and will practically escape from the river's mouth at each tide.

2. From his own and Dr. Adeney's very careful observations, the waters of the Usk at Pill Mawr contain far more than sufficient oxygen to deal with the Eastern Valleys sewage, and to render it harmless, and the oxygen will be so little reduced in this operation, bearing in mind the great dilution of the sewage, as in no way to interfere with the fishery interests.

3. The results of special experiments on the loss of dissolved oxygen in a mixture of the Usk water (collected at the proposed outfall site at Pill Mawr, and as far as possible under the conditions which would obtain if the outfall works were constructed) with a sample of sewage corresponding as far as possible with that to be expected from the Eastern Valleys, have confirmed the conclusion arrived at in 2.

4. His views on the suitability of the Pill Mawr scheme have been materially strengthened by the recently issued Eighth Report of the Royal Commission on Sewage Disposal.

If the Pill Mawr scheme is carried out, the fishery interests of the Usk, so far from being damaged, will be decidedly improved, owing to the amelioration which may be anticipated in the condition of the waters of the Afon Lwyd in consequence of the complete removal of sewage from them.

Finally, the author thanks the members of the Rhymney Valley Sewerage Board who have most kindly permitted him to give important figures from a private report made in connection with their Bill, proving that their great enterprise in constructing a trunk sewer twenty-six miles in length is well justified on scientific grounds; also the Eastern Valleys Sewerage Board (Pill Mawr scheme) for having given a similar permission to express in general terms his views on, and approval of their proposed scheme; and his colleague, Mr. F. Hummel, Professor of Engineering at the Queen's University, Belfast, for preparing the map which accompanies this paper from materials from various sources. The numerals on the map indicate the height above sea-level.

[*For discussion on this paper, see page 501.*]

On the Occurrence of the Fresh-water Alga (*Prasiola crispa*) on Contact Beds and its Resemblances to the Green Seaweed (*Ulva latissima*),

by E. A. Letts, D.Sc., etc. (Fellow).

IN the autumn of 1902 patches of a green growth made their appearance on some of the lower contact beds which had been installed for experimental purposes in the outfall works at Belfast, and by the spring of the following year these had developed into large patches of what had all the appearance of *Ulva latissima*, a seaweed which occurs in enormous amount in Belfast Lough, and by its decomposition on the shores has occasioned a most extensive nuisance which has led both to litigation and prolonged inquiries, partly by the Belfast Corporation and partly by the Royal Commission on Sewage Disposal.

The author is informed that a similar nuisance from the same seaweed occurs at Exmouth, and that both the growth of the seaweed and the nuisance arising from it have recently increased. On submitting the green vegetation found on the contact beds at Belfast to a botanist, it was pronounced by him to be *Ulva latissima*, and appears as such in Appendix VI. to the Fifth Report of the Royal Commission on Sewage Disposal; but the remark is there made that in 1904 "some at least of the seaweed was now found to consist of a species of *Enteromorpha*," identified as the latter by the same botanist who pronounced the 1902 growth to be *Ulva*.

It was only in 1909 or 1910 that this supposed seaweed was identified by Mr. A. D. Cotton of Kew (who was making a botanical investigation of the seaweeds in Belfast Lough for the Royal Commission on Sewage Disposal) as the fresh-water alga, *Prasiola crispa*, the identification being made from a pressed specimen prepared by the author in 1903–1904.

The matter remained almost forgotten until the autumn of 1912, when Mr. Colin Frye, one of the officers of the Royal Commission on Sewage Disposal, sent the author a box of a green growth from the contact beds of the Harrow sewage works in the belief that it was *Ulva latissima*, of which he had already considerable experience when making investigations for the Royal Commission at Belfast.

The author, however, at once realised that this growth was not *Ulva* but *Prasiola*, and the exact botanical identification followed a few days later in a communication from Mr. Cotton.

In a later letter from Kew, Mr. Cotton has kindly given the following particulars regarding the *alga* in question :—

"*Habitat.*—In the filamentous form it is abundant in towns in spring, in parks, and at the sides of damp paths, foot of walls and houses, especially in spots soaked with urine. But it is also found in paths in woods, on mountain slopes (there are fine specimens from Snowdon in the herbarium here), and it is partial to the old thatching of cottages. Under certain conditions, it assumes the foliose crisped form, probably where nitrogenous supplies are abundant. I can find no definite observations on this point."

The most interesting feature to the author as a chemist, in regard to this alga, was the remarkable amount of nitrogen which he found in such specimens as he examined.

In the sample obtained at Belfast, this amounted to 8·94% of the dried material, which is almost as high as that contained in dried meat (10·5%) and higher than that contained in dried cheese (7%). Whereas among vegetable products, peas contain from 4 to 4½%, the highest amount found in ordinary substances of a purely vegetable nature.

The author next examined the sample of *Prasiola* from Harrow. Having dried some of the carefully washed fronds, the nitrogen which they contained was determined and was found to amount to 7·22%, so that while still high, it was materially lower than in the Belfast sample.

The idea then occurred to him of investigating the powers possessed by this alga of assimilating compounds of nitrogen, in the same way as he and his colleagues had found in the case of *Ulva*, namely, by measuring a certain area of that seaweed and immersing it either in sewage polluted sea-water, or sea-water *plus* a definite proportion of a simple inorganic compound of nitrogen, such as an ammonium salt or a nitrate, only in the case of *Prasiola*, which is a fresh-water growth, it was, of course, necessary to substitute fresh for salt water.

In order to perform these experiments, it was necessary to obtain fresh supplies of *Prasiola*, and the author would express his thanks to Mr. J. Percy Bennetts, the Surveyor of Harrow, who has been so good as to furnish him with such quantities of that alga as were necessary for his investigations on this point.

Certain preliminary difficulties attended these experiments, which were not experienced in the case of *Ulva*, for in the first place that seaweed grows in fronds of such large size that it is easy to measure off a given portion, and to cut the latter out from the whole frond, and also the seaweed as it occurs in Nature is quite clean, except for a few shellfish which are easily removed. But *Prasiola* is different, or at least such samples as occur on contact beds. In the first place, the alga as received was always infested by those small organisms looking like particles of soot, familiar to all who are acquainted with contact beds, and are called *Podura aquatica.*

The fronds also swarmed with minute worms (identified as young earthworms by Dr. Gregg-Wilson, Professor of Zoology in the Queen's University of Belfast). Both of these were very difficult to get rid of, owing to their lurking in the folds of the *Prasiola*, and careful handling was essential during the repeated washings to which it was necessary to submit each frond before these two classes of organisms were got rid of.

An even greater difficulty was experienced in measuring a definite area of the *Prasiola*, and all that was possible was to float the washed fronds on to a sheet of glass of the given dimensions, until it was covered. The measurements thus made are at best very rough approximations, owing to the folds in the fronds, which in most cases could not be smoothed out without fracture. It may be mentioned that in the experiments on the absorption of ammonia by *Ulva* it had been ascertained by the author and his collaborators that the rate of absorption followed a definite physico-chemical law known as that governing the so-called "monomolecular reactions," which in this particular case may be stated as follows:—"The rate of absorption is constantly proportional to the concentration of the ammonia present."

The following experiments on the absorption of ammonia were performed with *Prasiola*:—

(1). Area of alga fronds about 50 sq. in. Solution of ammonium-chloride in ammonia-free distilled water of strength equal to 1·4 parts per 100,000 nitrogen. Volume of solution, half a litre. In 24 hours all the ammonia had disappeared from the solution.

(2). Same area of alga and same fronds which had been washed with tap-water and had remained for 24 hours exposed to air in a moist condition. Solution of ammonium-chloride of twice the strength used in No. 1. In 24 hours about one-third of the ammonia had been absorbed, and in 72 hours 42 per cent.

(3). Fresh sample of *Prasiola*. Area of fronds 100 sq. in. immersed in a sample of Belfast sewage (abnormally weak owing to unusually heavy rain). Nitrogen as free ammonia only ·3 parts per 100,000. Volume 1 litre. As this experiment was commenced on a Saturday, the solution was not examined until 48 hours later, when all the ammonia had disappeared.

It may be mentioned that in the experiments with *Ulva*, the strongest solution used contained 1·153 parts per 100,000 of nitrogen as ammonia, and that only 86 per cent. of this was absorbed by 100 sq. in. of the seaweed in 24 hours, so that *Prasiola*, in spite of its relative thinness (for

it is far thinner than *Ulva*), would appear to absorb ammonia with at least the same rapidity as *Ulva*.

The following experiment was made on the absorption of nitrates:— Area of alga 100 sq. in. Solution used, potassium-nitrate to distilled water of strength equivalent to 1·4 parts of nitric nitrogen per 100,000. Volume of solution 1 litre. Amount absorbed after one day and night, 37 per cent.; after two days and nights, 50 per cent.; after seven days and nights, 90 per cent.

In the experiments with *Ulva*, it has been found that in a given time the same area of seaweed absorbed about one-third of the nitrogen when presented to it in the form of nitrate, as it did when the nitrogen was present in the form of ammonia. That would also seem to be the case with *Prasiola*, if the results of a single experiment can be relied on.

The author has not had time to further investigate *Prasiola*, but he believes that the observations which he has been able to make on it are sufficient to prove its resemblances to the green seaweed *Ulva latissima*, not only in appearance, but also in its powers of absorbing inorganic compounds of nitrogen, such as ammonia and nitrates.

The work which the author has done on the chemistry of green seaweeds has suggested to him the question, is it not possible that seaweeds generally are a device of Nature's for checking the loss of nitrogenous materials from land surfaces and for rendering them again available for use by vegetation? It is well known that seaweeds are used extensively as manures, and that they are often the chief, if not the only materials of that nature available for the purpose, and they occur as a rule, he believes, only quite close to coasts, with no doubt some exceptions. May they not act as filters, so to speak, of the nitrogenous materials washed down by rain from land surfaces? In connection with this matter, he has often speculated on the special functions of the green seaweed *Enteromorpha intestinalis*, which is found so frequently, if not invariably, where fresh-water streams join the sea, so much so indeed that in many localities the junction of the two is marked (at low tide) by the greenness of the shore. In country districts, there is not much likelihood of nitrogen in the form of ammonia being the chief nitrogenous constituent of the fresh-water streams as it is relatively speaking soon oxidised to nitrates, and it therefore occurred to him that *Enteromorpha* might be specially "greedy" of that form of nitrogen, and be capable of absorbing it rapidly.

Some particularly fine fronds of that seaweed were obtained from the mouth of the Lagan river at Belfast, and also some large pieces of *Ulva*

latissima from Belfast Lough, and the absorptive powers of the two contrasted for nitrates and ammonium salts respectively, in the form of potassium nitrate on the one hand and ammonium chloride on the other. The results of these experiments may be tabulated along with those already described for *Prasiola*.

(1) Area of alga, 100 square inches.* Solution used, ammonium chloride (nitrogen = 1·4 per 100,000).

Time.	Absorption per cent.		
	Ulva latissima.	*Enteromorpha i.*	*Prasiola c.*
24 Hours	40	100	100

(2) Same area of *algæ*. Solution used, potassium nitrate (nitrogen = 1·1 per 100,000).

Time.	Absorption per cent.		
	Ulva latissima.	*Enteromorpha i.*	*Prasiola c.*
24 Hours	17	70	37
48 "	25	90	50
96 "	50	—	—
168 "	—	—	90

The author would not of course regard single experiments of the kind as conclusive, but the results obtained are at least suggestive and in harmony with the views expressed above.

* The area of the *Prasiola* was really only 50 square inches, but only ½ litre of solution was used, whereas in the other cases the area was 100 square inches, and the volume of the solution 1 litre.

[*For discussion on this paper, see page 501.*]

The Evolution of Sewage Disposal, by ARTHUR J. MARTIN, M.Inst.C.E., F.G.S. (FELLOW.)

OUR President, in his brief but interesting address, has sketched the progress of sanitary engineering during the past third of a century. I propose in the present paper to review somewhat more fully the evolution of that branch of sanitation which has made the greatest strides during that period, taking as my starting point the history of the sewage problem of the City of Exeter whose hospitality we are now enjoying.

Exeter was one of the first places in the kingdom to provide itself with sewers, formed in many cases by covering in natural watercourses, and discharging at various points into the river or the mill leats connected therewith.

The first definite step towards taking the sewage out of the river was a resolution passed by the City Council on 24th February, 1870, instructing their then surveyor, the late Mr. Charles E. Ware, to prepare a report on "the best means of deodorising and disposing of the sewage of the city." The following is a synopsis of the subsequent history of the matter:—

1870, May 26th. Report by Mr. C. E. Ware, reviewing the existing state of our knowledge, and recommending the disposal of the sewage by irrigation on land between the river and the canal near King's Arms sluice gates.

1871, August 23rd. Agreement between the Corporation and the "City of Exeter Sewage, Manure, Irrigation, and Farming Company, Ltd.," formed under the chairmanship of Colonel Brent to deal with the sewage by precipitation in tanks near Trew's Weir, and irrigation on some 500 acres of land in the parish of Alphington. A contract for the execution of a part of the work was entered into, but the project ended in litigation.

1874, November 16th. Report by your President, Mr. Boulnois, who followed Mr. Ware as City Surveyor, recommending the laying of an outfall sewer down the west bank of the canal to Turf, with outlets along its course for the irrigation of the marshes to the westward, and an outfall into the tideway for the discharge of the sewage at such times as it was not required on the land.

1880. Scheme prepared by Mr. Boulnois for dealing with the sewage by settlement at Duck's Marsh, and subsequent treatment on osier beds.

1886, November 26th. Preliminary report by Mr. Donald Cameron, who succeeded Mr. Boulnois in 1883. Mr. Cameron's recommendations were in the main on the same lines as those of his predecessor, but he

indicated the possibility of utilizing the water-power at Countess Weir Mills, then running to waste, to pump the sewage on to the high land towards Topsham.

1893, January 5th. Second report by Mr. Cameron, further developing his proposals.

1893, March 9th and June 24th. Further reports by Mr. Cameron, recommending certain modifications in his scheme as the result of an inspection of a large number of sewage works in various places.

1893, November 10th. Report by the late Mr. George Chatterton on Mr. Cameron's amended scheme. He approved of it in principle, but, in view of the opposition apprehended from the owners of certain property in the neighbourhood of Duck's Marsh, recommended the removal of the works to the opposite, or right, bank of the river near Double Locks.

In the autumn of 1894, following a conversation with the then chief engineer of the Local Government Board, the City Council abandoned the scheme they had in hand, and decided to carry the sewage a mile-and-three-quarters further on, and to discharge it without treatment into the tidal waters of the Exe at the mouth of the Alphin brook.

A local inquiry was held in October of the following year, and on the 7th January, 1896, the Board intimated their inability to sanction the scheme.

In the meantime Mr. Cameron had invented his septic tank. The City Council, as the result of an exhaustive examination of its working by Dr. Dupré, Dr. Rideal, and Dr. Sims Woodhead, adopted a scheme on the septic tank system. The Local Government Inquiry, held on November 23rd, 24th, and 25th, 1897, excited great interest, and was attended by engineers and others from all parts of the kingdom. The loan was duly sanctioned, and the works now in operation were laid down.

I have set forth the history of the Exeter sewage problem because it is typical of that of a large number of towns, but more particularly because it points a moral which is in some danger of being overlooked. One after another, schemes have been drawn up for dealing with the sewage of the city by irrigation, precipitation and filtration, dilution and biological action, each method in turn being acclaimed as the final solution of the problem, and each in turn being thrown aside in favour of some new development.

Within the short space of a generation the theories on which the purification of sewage is based have undergone a series of sharp reversals. Prior to the passing of the Public Health Act, 1875, local authorities laid down their sewers, and discharged their sewage into the nearest stream,

and were not ashamed. They had, indeed, done all that the law required of them. So high an authority as the late Sir Robert Rawlinson, who presided over the Engineering Section of the Sanitary Congress held here in 1880, asked in one of his lectures "whether it was better to pollute rivers or pollute towns and houses, to kill fish or to kill men?"

Then came a swing of the pendulum. An outcry arose, not without cause, against the gross pollution to which our rivers were then subjected, and irrigation, originally viewed with dislike and suspicion, came to be looked on as the standard method of disposal. High expectations were formed of the profits to be derived from sewage farms, but it soon became apparent that these could only be looked for where the circumstances were exceptionally favourable.

To the vogue of the sewage farm succeeded that of chemical precipitation. The sludge in its turn was looked on at first as a commodity which would command a ready sale at good prices, and subsequently as a nuisance to be got rid of at the least possible cost.

The introduction of bacterial methods of sewage purification, while reversing many of the opinions upon which the older modes of treatment had been founded, brought with it a fresh crop of controversies. The conflict between the so-called aërobic and anaërobic methods of preliminary treatment, and that between contact beds and trickling filters, are too fresh in our memory to need more than a passing mention. The question of the precise percentage of the sewage solids which can be destroyed by bacterial action attracted an amount of attention out of all proportion to its intrinsic importance, but in the end Mr. Cameron's early estimate of the amount of digestion which took place in a septic tank has been confirmed with remarkable closeness by the investigations of the Royal Commission on Sewage Disposal.

Whatever difference of opinion there may have been concerning details, the fact that the biological process is Nature's own method of disposing of waste organic matter was generally regarded as an effective guarantee of its finality. Even this conclusion has not gone unchallenged, the apostles of the Hampton doctrine maintaining, with an ingenuity and persistence worthy of a better cause, that the microbe is little better than a myth, and that the operations involved in the purification of sewage are essentially mechanical. But, the Hampton doctrine notwithstanding, there is a very general tendency at the present time to entrust the work of sewage disposal to bacterial agency, and the results have on the whole been satisfactory.

Another disturbing factor in connection with the purification of sewage

is the demand which has been put forward in certain quarters that effluents should be sterilised before discharge. When we consider that sterilisation, to be effective, must be applied not only to the effluent, but to every storm overflow, whether on the lines of sewers or at the outfall, the gravity of the issue thus raised will be apparent.

The present position may be shortly summed up as follows:—

We can produce with certainty an effluent which is inoffensive and chemically stable.

The putrescible solids in sewage can be converted either by aërobic or anaërobic methods into a much smaller volume of inoffensive residuum.

The effluent can be completely sterilised, though not without risk of upsetting the balance of life in the river into which it is discharged.

All these things can be done, at a price. The question is: is the game worth the candle?

At a sessional meeting of the Institute held in London four years ago, Mr. Scott-Moncrieff asserted that the pollution of rivers was not a danger to health, and that the justification for the laws prohibiting such pollution was mainly, if not solely, æsthetic. These opinions were severely criticised, but they find support in the best practice in Germany and the United States of America, where discharge into a large body of fully oxygenated water has long been regarded as a scientific and hygienic mode of disposal. The purification of sewage by dilution is expressly sanctioned by the Eighth Report of the Royal Commission, which lays down the conditions under which untreated sewage may safely be discharged into a river. Had this report been in existence in 1895, it is possible that the Exeter City Council would not have gone to the expense of filtering their sewage.

There is yet another side to the question. It has long been recognised that the discharge of the sewage of our cities and towns, with or without purification, into rivers, involves a loss of fertilizing material which can ill be spared. The sources of the manures upon which our crops depend are fast being depleted, and, as Sir William Crookes pointed out in his presidential address to the British Association in 1898, the question of maintaining the productiveness of our fields may soon become an exceedingly grave one. With such a prospect before us, is it wise to neglect altogether the manurial value of our sewage?

The history of sewage farms has not been very encouraging, but the ill success of the majority of them is no proof that sewage is without value as a manure. If sewage farms have failed, it has too often been because they have not had a fair chance. Farming in England nowadays is at

best a hazardous and highly speculative business, demanding for its successful prosecution an amount of skill and experience not usually possessed by a borough or district council. The difficulty is aggravated by the conditions under which a sewage farm committee too often work. Hampered as they are by statutory limitations, with the fear of the auditor before their eyes, harassed by short-sighted and often malicious criticism, at the mercy of an ungrateful and capricious electorate, the wonder is that they succeed so well as they do. In addition to all their other hindrances, the area of the land at their disposal is generally so restricted as greatly to hamper the purification of the sewage, and to render its profitable employment out of the question. It is no reflection, therefore, upon the business capacity of our sewage farm committees that they should so rarely have succeeded in covering their working expenses.

The best results from an agricultural point of view have generally been obtained from the supply of sewage to farmers or landowners having extensive areas at their command. This practice has fallen into disrepute, on the ground that private individuals, working as they do for profit, are without that concern for the proper purification of the sewage which is uppermost in the thoughts of a right-minded local authority. But even from a purification point of view, it is doubtful whether this drawback is not more than offset by the many advantages which a farmer enjoys, as compared with a local authority, more particularly where he has a large area of land at his disposal. And it ought not to be difficult to find a way to hold him responsible for any gross neglect in the management of the sewage supplied to him.

I trust I have said enough to show that the problem of sewage disposal is a many-sided one, which should not be viewed exclusively from a single standpoint. It will also be admitted that the science of the subject is still incomplete, and that it would be a blunder of the worst kind to treat our present knowledge of it as final, or to stereotype the particular stage of its development at which we happen to have arrived to-day.

Even if the principles which govern the treatment of sewage were definitely established, which is a very large assumption to make, we have still much to learn with regard to the inner working of purification processes. It is inevitable too that modifications in points of detail will be brought forward from time to time, and new constructions and appliances introduced, which may or may not be improvements upon those already in use. The Local Government Board has neither the organisation nor the equipment required for the testing of such new departures, and it is not fair to throw upon them the onus of their adoption or rejection without

furnishing them with guidance on which they can depend. Few of us probably would wish to see their hands tied anew, as they were from 1884 to 1901 by the findings of the Metropolitan Sewage Commission.

We must keep abreast of the times. The probability of further discoveries in relation to sewage disposal, and the need for definite scientific research, have been clearly pointed out by the Royal Commission, and their recommendation that a central authority should be created to carry on their work should no longer go unheeded. Economists (self-styled) will doubtless cry out at the cost of a new department; but we cannot afford again to cut ourselves off from the possibility of profiting by the advance of science and the accumulation of experience, in a matter so vital to the health and well-being of the country.

[*For discussion on this paper, see page 501.*]

Chemical Precipitation at the Sewage Disposal Works, Wakefield, by J. P. Wakeford, Assoc.M.Inst.C.E., City Engineer.

IN the notes which I had the privilege of placing before the Institute at the Congress held in Belfast, two years ago, I gave a brief account of the preliminary trials of precipitants at the above works. Since then the extension scheme has been in progress, and the experiments have been continued under more favourable conditions. Two lime mixers (Gabbett's patent) have been installed, and are working satisfactorily; thorough mixing of the precipitants with the sewage is being obtained by means of baffles fixed in the main feed carrier, and the tanks have been enlarged and scum boards fixed, so that better results can be obtained under more accurate control.

One or two points of general interest naturally occur to one in preparing a paper of this description. If it had been possible to avoid precipitation of the Wakefield sewage I should certainly have done so, since the cost is estimated at not less than £1,000 per annum. It would, however, be impracticable to adopt any treatment other than precipitation, since the sewage is composed of sixty per cent. trade waste, notably wool-scouring refuse.

Settlement alone, as will be seen from the analysis appended, gives only 35·8 per cent. purification on the oxygen absorption figure, and the suspended solids in themselves are sufficient to condemn a tank effluent of this nature from entering any type of biological filter. Secondary filtration would undoubtedly be necessary with an effluent of this kind, and this would mean an additional pumping installation.

In all schemes where precipitation is adopted, it is essential that some type of recording apparatus be fixed for the measurement of the flow, consequently a Lea Recorder, over a 4 ft. weir, has been installed at Wakefield, and is working satisfactorily. A record of the flow is also most useful in the mixing of samples in proportion thereto, since an analysis of a mixed sample taking equal quantities every hour is valueless, yet how many persons having sewage works under their control still mix the samples in this way. A moment's thought ought to convince anyone of the insufficiency of this method, especially when it is realised that at the time the volume is greatest the sewage is strongest.

At times one hears it stated in regard to precipitation works that a better result can be obtained when the tank is full up with sludge, and ready for cleaning out; this is a fallacy and may account for the fact that

the solids in a tank effluent can frequently be found in excess of those in the crude sewage entering the tank.

As to purification of a tank effluent, I consider 50 to 60 per cent. quite satisfactory for a sewage of the character of the Wakefield sewage, when followed by percolating filters and humus tanks.

The preliminary tests referred to in my notes of July, 1911, proved that lime and ferric sulphate gave the best results; but owing to the increased price of chemicals since that date (sulphuric acid from 34s. to 40s., and ferric hydrate from 26s. to 31s. 6d. per ton), the cost of producing ferric sulphate is considerably in excess of the figures then given. I therefore set myself to find, if possible, a more economical precipitant.

Lime.—Using lime alone the tank effluent was rather turbid at times, but using about 18 grains per gallon it proved on the whole very satisfactory. Lime undoubtedly is the cheapest precipitant, and I have found that by its use the purification can be kept up to 50 per cent. Our filters, however, have not yet been got to work, and it therefore remains to be seen how a lime effluent will behave upon them, as it is impossible to prevent slight excess of alkalinity at times when using lime alone. Should this precipitant prove satisfactory a great saving will be effected, as the cost will not exceed £700 per annum.

The chief disadvantage of using large quantities of lime is the amount of sludge made in proportion to the percentage of purification effected. I estimate that nearly 20 per cent. more sludge is produced when using lime alone than when used in conjunction with Spence's aluminoferric or Pochin's ferric sulphate.

Aluminoferric.—Two varieties, A quality and M cake, were tried; M cake, which contains more iron than the A quality, proving much better for our sewage than the latter. It will be seen from the analyses that M cake gave excellent results.

Ferric Sulphate and Lime.—This precipitant continues to give good results, though I find that the proportions best suited to our sewage, from an economical standpoint, are 7·84 ferric sulphate and 12·15 lime grains per gallon. Other precipitants have been tried, but the results were not sufficiently satisfactory to place on record.

The tanks at Wakefield are of the continuous-flow type, and are cleaned out once a fortnight; the sludge flows through conduits into open sludge tanks, which are at a higher level than the detritus tanks, permitting of the top water from the settled sludge being drawn off by floating arms into the detritus tanks. In this way the moisture is reduced to 93 per cent. Some 18,000 gallons per day of this sludge are

pumped into trenches three feet wide, with five feet centres, dug in the former land filtration areas. The areas are 21 acres in extent in addition to banks, roads, etc. This method of sludge disposal has been in progress for the past three years, and has been found highly satisfactory from the point of view of reducing the nuisance to a minimum, and the smallness of the cost. The amount expended per annum on this work is approximately £370 = 4·10 pence per ton of sludge containing 90 per cent. water, which cost includes also the sludging of the tanks.

The sludge trenches were at first dug 1 ft. 6 in. deep, but it has recently been found better to reduce the depth to 12 inches, the sludge drying more rapidly in the shallower trenches. Analyses of the sludge show that it takes two years at 1 ft. 6 in. deep (I estimate 15–18 months with trenches 12 inches deep) to reduce the moisture to 58 per cent., in which condition the sludge smells earthy, but has entirely lost all sewage

Precipitant.	Proportion of precipitant in grains per gall.	Percentage of Mixed oxides ($Fe_2O_3 : Al_2O_3$).	Percentage Purifn. on oxy. absorbed figure.	Cost per mill. galls. £	s.	d.
Lime alone	18	—	50·5	0	17	8
Ferric sulphate / Lime	7·84 / 12·15	12·9	59·0	1	9	10
Spence's M cake / Lime	7·84 / 12·50	16·63	59·2	1	12	4
Spence's A quality Alumino ferric / Lime	6·25 / 15·00	15·13	54·6	1	15	6

Results in parts per 100,000.

	Crude sewage.	Settled sewage.	Crude sewage.	Lime effluent.	Crude sewage.	Ferric sulphate and lime	Crude sewage.	Spence's M cake and lime.	Crude sewage.	Spence's A quality Alumino ferric and lime.
Oxy. absd. in 4 hours from $\frac{N}{80}$ $KMnO_4$ at laby. temp	11·84	7·60	11·06	5·48	11·69	4·80	11·04	4·50	12·87	5·84
Chlorides (as Cl)	17·0	16·7	19·6	18·8	20·2	18·8	15·8	16·0	20·4	19·8
Alkalinity (as CaO)	very slight	very slight	very slight	1·6	very slight	neutral	slight	slight	very slight	very slight
Suspended solids—										
Total	51·0	22·6	45·8	5·2	40·88	4·82	45·0	3·5	50·4	6·3
Loss on Ignition	23·8	12·6	25·4	2·3	26·14	2·70	23·3	1·7	32·7	3·8
Ash	27·2	9·4	20·4	2·9	14·74	2·12	21·7	1·8	17·7	2·5
Percentage purification on the Oxygen Absorption figure	35·8		50·5		59·0		59·2		54·6	

odour, although presenting a decidedly black appearance. I estimate that our 21 acres of sludge trenching area are being raised at the rate of 1·87 inches per annum. These areas were formerly used for filtration purposes, but the land proved altogether unsuitable for this purpose, being for the most part clayey marl.

In the Eighth Report of the Royal Commission on Sewage Disposal, it is recommended that the dissolved oxygen test shall supersede all others. I have not included this test in the analyses, as I consider the five-day test too long for the crude sewage and tank effluent, and I believe that sewage works managers will keep to the oxygen absorption test for these samples, though it would be well to have one standard recognised method of estimation. It is quite time some uniform test such as that suggested by the Royal Commission was adopted, as in reading through analyses of say the oxygen absorption figures it is necessary to ask under what conditions these have been carried out (*a*) with strong or weak permanganate, (*b*) temperature 80° F. or the laboratory temperature, (*c*) is the permanganate added in 50 cc. at a time or with only 10 cc. of dilute permanganate in excess. The Royal Commission have answered a real need in suggesting one test to be done by one method only.

The dissolved oxygen taken up by the Wakefield sewage works out at about 40—45, and the tank effluent at 18—20 parts per 100,000.

[*For discussion on this paper, see page 501.*]

The Chemical and Bacterial Condition of Rivers above and below the Sewage Effluent Outfall, by J. E. PURVIS, M.A., University Lecturer, Corpus Christi College, Cambridge (MEMBER), and A. E. RAYNER, M.A., M.B., B.C., Gonville and Caius College, Cambridge.

IN the 4th Report, Part II. (1905), of the Royal Commission on Sewage Disposal, there are a few analyses of river waters with and without admixed effluent from sewage farms. The Commissioners' engineer, Mr. Kershaw, states (*loc. cit., p.* 77) that the river Cam, at the main effluent outfall, had a normal flow of about 30 million gallons per 24 hours, and the volume of the effluent as compared with the volume of the river was about 1 to 15 normally. Five samples taken from above, and at 10 and 100 yards below, the effluent were chemically examined. For the purposes of comparison it will suffice to cite the analyses of the river water above the outfall, and 10 yards below the outfall. The numbers represent parts per 100,000, and only those items are taken from the Report which are comparable with those of our own work.

	Cam river water above the effluent outfall.	Cam river water containing effluent, 10 yards below the effluent outfall.
Ammoniacal nitrogen	0·019	0·190
Albuminoid "	0·037	0·030
Nitrous "	none	none
Nitric "	0·45	spoilt
Oxygen absorbed from permanganate at 80° F. in 4 hours ...	0·42	0·20
Chlorine	2·06	2·84

An analysis of another sample taken a month earlier, 100 yards below the effluent, shewed that the nitric nitrogen was ·6 parts per 100,000.

It seemed to be of some interest to continue these investigations both chemically and bacterially, for they may be typical; and the authors have studied the Cam river above and below the effluent outfall on a more extensive scale, in order to see how far down the river its chemical and bacterial conditions vary, and particularly as to the latter with regard to *B. coli.* For this purpose the water from different parts was systematically examined, beginning at 100 feet above the outfall and extending 4 miles below it. There is a possibility of further pollution at Clay Hythe, 2 miles from the outfall down the river, and there is also a houseboat station a quarter of a mile below Clay Hythe, but there did not appear to be any great indication of pollution from it.

The water for the analyses was collected on the 18th and 19th of May and the 12th of June, 1912. The amount of effluent being discharged

TABLE A.—*Average Chemical (in parts per 100,000) and Bacterial (in 1 cc.) Analyses of the Cam Water above and below the Effluent Outfall.*

	100 feet above Outfall.	Crude Effluent.	8 feet from Outfall.	¼ mile below Outfall.	½ mile below Outfall.	¾ mile below Outfall.	1 mile below Outfall.	1½ miles below Outfall.	2 miles below Outfall.	2½ miles below Outfall.	3 miles below Outfall.	4 miles below Outfall.
Free and Saline Ammonia...	·068	...	·379	·112	·0846	·102	·074	·0712	·0862	...	...	...
Albuminoid Ammonia	·0336	...	·0846	·032	·0286	·034	·035	·0275	·0412	...	...	...
Oxygen absorbed in 4 hours at 80° F.	·3143	...	·678	·2039	·2035	·254	·222	·216	·2213	...	...	...
Nitrogen as Nitrates	·55	...	·55	·65	·583	·65	·575	·575	·575	...	...	...
Nitrogen as Nitrites	Only traces were found, but there was a tendency to an increase down the river.											
Chlorine	3·06	...	4·483	3·4	3·4	3·5	3·35	3·35	3·35	...	...	...
B. coli found in 1 cc..........	661	102,422	27,522	...	6,670	...	14,443	8,540	6,377	2,349	1,525	30

on the first two days was small compared with that on the 12th June. Several bacterial analyses for *B. coli* were also completed in August, 1912. It is not necessary to quote in detail the results of each analysis. All the samples were taken from 18 inches below the surface of the river and in midstream. They were obtained between 6 a.m. and 8 a.m., so that the effluent should have had a full opportunity of being fairly well filtered.

It is clear from the above table that the river is polluted at Clay Hythe (2 miles below the effluent). The bacterial analysis shows marked pollution at about three quarters of a mile down, and the chemical figures are higher than at half a mile; and, even at 2 miles, the two ammonia figures are higher than at 100 feet above the effluent.

It is of some importance to note that the figure for the absorbed oxygen goes down very rapidly, so that at a quarter of a mile it is below that at 100 feet above the outfall; it increases at three quarters of a mile and again rapidly decreases, so that at 2 miles it is again lower than at 100 feet above the outfall. There is, therefore, clear proof that the dissolved oxygen in the stream comes at once into action, and thereby decreases the amount of easily oxidisable substances in the effluent. The nitrate figure shows a definite increase even at 2 miles, and the nitrates may also assist in the oxidation of the organic matter. The chlorine figure, of course, shows a slight increase.

On the whole, chemically, the river purifies itself from the contaminating effluent moderately well; for between half a mile and three quarters of a mile, the albuminoid ammonia and the oxygen absorbed figures are lower than at 100 feet above the effluent outfall.

Bacterially, the filter beds of the sewage farm evidently were acting very badly, and the purification by the river was slow. It is difficult to say how soon the *B. coli* would die out, if the river received no further pollution than that which it gets from the effluent outfall. Probably, from a consideration of these and other numbers, the river might contain very few of them at 2 to 3 miles below the outfall.

As only a microscopic examination of the colonies was made, the numbers of *B. coli* found in 1 cc. of the river water only indicates those which produce acid in lactose. But if, as it is reasonable to suppose, they are all of intestinal origin and mainly human, and that they all live the same length of time under the conditions of the examination, we can get a fairly accurate relative number by making use of the proportions in which they usually occur in the human intestine. Table B contains the relative proportions of the other organisms in the colonies calculated on these usually accepted relative proportions.

A series of bacterial analyses were also done in August, 1912. Table

TABLE B.—*Comparative Table of the various kinds of Intestinal Bacilli in 1 cc. of the Cam Water found at various places above and below the Effluent Outfall.*

	100 feet above Outfall	Crude Effluent.	8 feet from Outfall.	½ mile below Outfall.	1 mile below Outfall.	1½ miles below Outfall.	2 miles below Outfall.	2½ miles below Outfall.	3 miles below Outfall.	4 miles below Outfall.
B. coli communis	251	38,930	10,458	2,534	5,480	3,245	2,423	892	579	11
B. acidi lactici	224	34,823	9,357	2,267	4,903	2,903	2,168	798	518	10
B. coli communior	99	15,363	4,128	1,000	2,163	1,281	956	352	228	4
B. lactis aerogenes	79	12,290	3,302	890	1,730	1,024	753	281	183	3

Table C.

	August 5th, 1912.						August 6th, 1912.						Aug. 8th, 1912.		
	In ·005 cc.		In ·001 cc.	In ·05 cc.		In ·01 cc.	In ·0025 cc.		In ·005 cc.		In ·01 cc.	In ·02 cc.	In ·001 cc.	In ·01 cc.	In ·1 cc.
100 ft. above outfall	—	—	—	0	?1	0	—	—	0	1	—	0	9	13	111
8 feet from outfall.	0	0	0	0	0	—	1	0	—	—	1	—	13	8	274
½ mile below outfall	0	0	0	0	0	—	0	0	—	—	0	—	13	13	120
1 mile below ……	0	0	0	0	0	—	1	1	—	—	5	—	0	1	46
1½ miles below……	0	0	0	0	0	—	0	3	—	—	—	—	0	0	40
2 miles below ……	0	0	0	0	0	—	2	1	—	—	5	—	19	16	199
2½ miles below……	0	0	0	0	0	—	1	0	—	—	3	—	4	8	174
3 miles below ……	—	—	—	—	—	—	0	0	—	—	1	—	3	12	28
4 miles below ……	—	—	—	—	—	—	0	0	—	—	0	—	0	1	8

August 13th, 1912.

	In ·001 cc. of water.					In ·01. cc. of water.					In ·1 cc. of of water.	
100 ft. above outfall	0	0	1	0	0	0	2	0	4	0	2	1
8 feet from outfall.	0	3	1	0	4	22	16	35	10	24	480	800
½ mile below outfall.	1	0	1	0	0	7	4–6	5	5	1	272	240
1 mile below ………	1	0	2	2	0	12	18	20	8	9	—	—
1½ miles below ……	0	3	1	7	2	24	30	66	16	21	1360	912
2 miles below………	3	5	0	4	4	47	25	28	47	68	650	524
2½ miles below ……	0	0	0	0	0	0	0	0	0	0	14	24
3 miles below………	0	0	0	0	0	0	0	0	0	0	6	18
4 miles below………	0	0	0	0	0	0	0	0	0	0	8	9

August 17th, 1912.

	In ·01 cc. of water.				In ·02 cc. of water.				In ·2 cc. of water.			
100 ft. above outfall	—	—	—	—	—	0	0	2	0	6	61	64
Crude effluent ……	1160	810	980	944	—	2400	2176	2600	2016	1560	—	—
8 feet from outfall..	165	204	152	180	—	496	408	320	270	204	—	—
½ mile below outfall	—	—	—	—	—	172	160	152	136	154	1248	1384
1 mile below ………	—	—	—	—	—	180	150	472	336	340	3632	—
1½ miles below ……	165	145	216	141	192	502	672	1040	400	—	—	—
2 miles below………	10	5	3	2	5	14	6	15	8	8	—	—
2½ miles below ……	8	2	10	0	0	5	8	3	5	0	—	—
3 miles below………	—	—	—	—	—	12	16	45	10	18	140	148

C contains more detailed results of the number of *B. coli* after forty-eight hours' cultivation on McConkey's neutral-red-lactose-agar medium, in volumes of the river water varying from ·005 cc. to ·1 cc., and at varying distances from the effluent outfall.

The relationship of the figures is somewhat disappointing, as, even when the greatest care was taken, they do not bear much resemblance to the various dilutions. But they are of outstanding interest in showing, in considerable detail, the variations in the pollution of the river by *B. coli* from day to day, and at different distances from the source of the contamination, *i.e.*, the effluent outfall.

General Results.

The chemical and bacterial conditions of the stream will vary constantly, quite apart from the daily variations caused by the sewage effluent; but, on the whole, it may be concluded that the river is influenced only moderately well by what may be called natural purification.

The dangerous pollution, as indicated by *B. coli*, coming from the discharge of the sewage effluent into the stream, is still well marked at between three and four miles below the effluent outfall. It will be observed, however, that there is a definite amount of purification in this respect at four miles below, as compared with that at 100 feet above, the outfall. If the river were to receive no further pollution after that which is poured into it from the effluent outfall, it is, perhaps, probable that at about three miles below the outfall the water would be comparatively free from *B. coli*.

The chemical purification is moderately fair, for at two miles below the effluent outfall the river showed a definite amount of purification, notwithstanding the fact that at three quarters of a mile below there is some contamination from another source. At half a mile below the outfall the chemical purification is also fairly good.

How far the nature of the effluent poured into the stream will have to be controlled so as to come within the suggested chemical standard of the Royal Commission on Sewage Disposal (8th Report, 1912, Vol I.) as regards the volume of the diluting stream, and therefore influenced by the amount of oxygen actually dissolved in the stream, is a subject for future research; and how far it may be possible to ensure an effluent purer bacterially is a question which has not yet received a definite answer. Nor, at present, does there appear to be a great necessity for such sterilisation, so long as the water is not used for household purposes. In the case of a tidal stream, at the mouth of which there are oyster beds, the necessity for greater care is more obvious.

[*For discussion on this paper, see page 501.*]

Land Filtration Effluents, by WILLIAM CLIFFORD, Assoc.M.Inst.C.E. (MEMBER).

THE purification of sewage by land filtration is, on any given plot, an intermittent process. The irrigated area is dosed with the liquid to be purified for a longer or shorter period, then rested for a corresponding period, during which the liquid accumulated in the gutters and on the surface continues to percolate into the soil. A portion, under favourable conditions, is evaporated.

The liquid varies in quality and rate of flow from hour to hour, and from day to day, and the effluent from the land drains varies in consonance with the variations of the liquid on the surface. It continues to vary when the irrigating liquid is stopped, *i.e.*, during the resting period.

The observations to be described were made at the Wolverhampton Corporation Sewage Farm, and relate to the variation in quality and rate of flow of land effluents, and the relative volumes of irrigating liquid and effluent.

The procedure in general use on the farm is, on any given plot, irrigation for two days, then rest for two days. At the week-end the irrigation or the resting period is extended to three days. Certain fields are sometimes worked on a twenty-four hours cycle, *i.e.*, irrigated twelve hours and rested twelve hours. The variation in the quality of the effluents by both methods of working is given below.

The first series of observations was made on 15,900 square yards of Field No. 32 during December, 1902. Irrigation was begun at noon on December 8th, after the usual week-end resting period, and continued uninterruptedly until 6.30 a.m. on December 12th, after 90½ hours. A sample of effluent was drawn one hour after irrigation had begun, and every subsequent six hours for seven days. The sampling thus continued three-and-a-half days (84 hours) after irrigation had ceased.

The albuminoid nitrogen increased during the three days' irrigation, from ·024 to ·113 parts per 100,000, and the oxygen absorption in four hours from ·26 to ·77. The nitric nitrogen increased from ·71 to 1·00 during the first 18 hours, then decreased to ·64 at the end of three days. During the resting period the quality of the effluent improved steadily, and at the end of three days the albuminoid nitrogen was ·036, and the oxygen absorption in 4 hours 2·20 (see Fig. 1).

The next series of observations was made during May, 1909, in Field No. 5. This plot (5,280 sq. yards) was irrigated during the day and

rested at night. The volume of liquid irrigated, and of effluent draining away, was measured over V notches. A sample of effluent was drawn every six hours, beginning one hour after irrigation had begun, and continued for 102 hours, four periods of irrigation and rest.

There was a well-marked rise and fall in the organic matter content of the effluent during 24 hours, as represented by the albuminoid nitrogen and oxygen absorption. During the first irrigation period the albuminoid

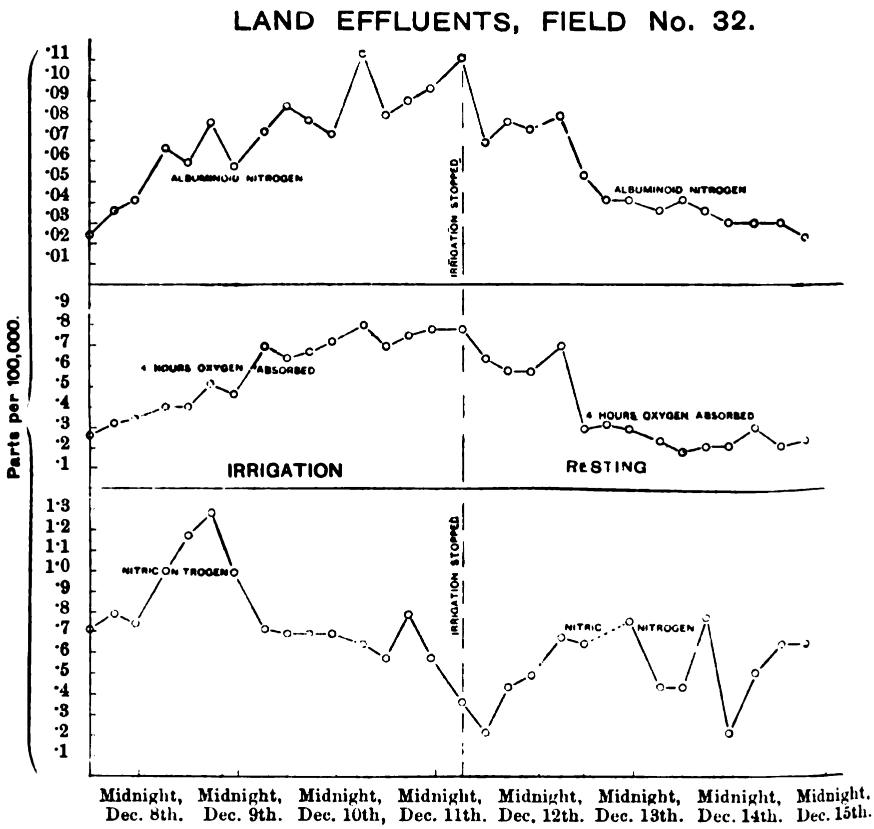


Fig. 1.

nitrogen increased from ·066 to ·109 part per 100,000, and the oxygen absorption from ·6 to 1·34. At the end of the resting period, the corresponding figures are ·032 and ·25.

The plot received a larger quantity of liquid than usual, owing to the increased head necessitated by the measuring arrangement. The effect of the continued overdosing was very noticeable on the fourth day, when the nitric nitrogen almost disappeared.

The "curve of flow" of the effluent accompanies the increase and

decrease in the quantity of organic impurity. The volume of liquid irrigated and of effluent drained away during each period is given below.

Period.	Hours during which period lasted.	Volume of liquid irrigated.	Volume of effluent.	Effluent as a percentage of the irrigated liquid.	
Irrigation ...	13	44,680 gallons	26,830 gallons	60·0	79·9
Resting	9		8,900 "	19·9	
Irrigation ...	14	52,850 "	39,050 "	73·9	97·4
Resting	15		12,530 "	23·5	
Irrigation ...	14	50,090 "	37,400 "	74·7	79·6
Resting	3		2,450 "	4·9	
Irrigation ...	19	63,200 "	57,180 "	90·5	93·7
Resting	3		2,040 "	3·2	

The total volume of effluent is equal to 87·6 °/₀ of the irrigated liquid (see Fig. 2).

LAND EFFLUENTS, FIELD No. 5.

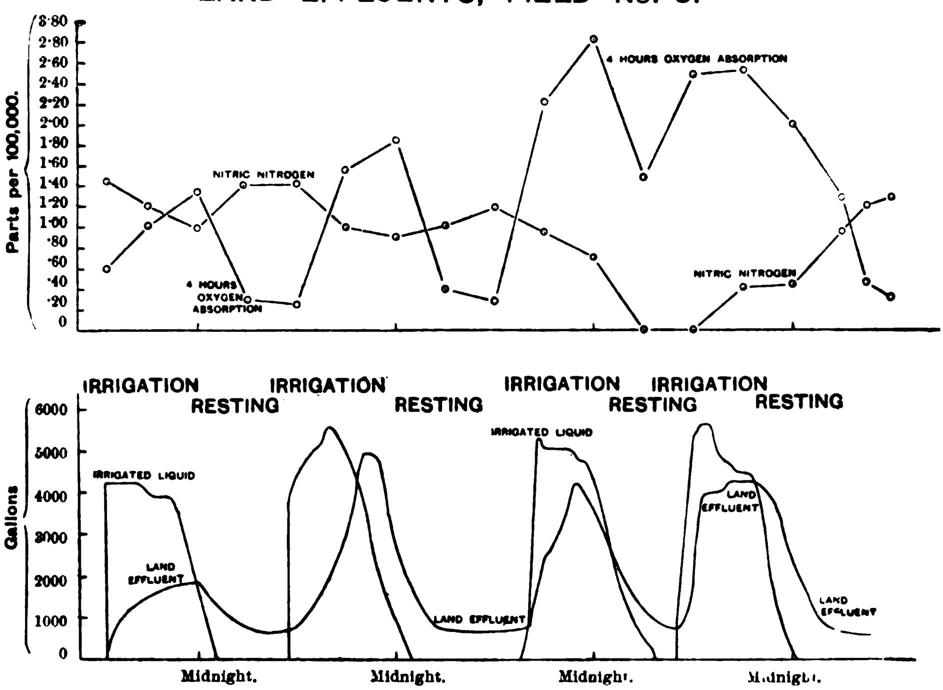


Fig. 2.

The third series of observations was made during May, 1909, in Field No. 36. The plot had an area of 7,700 square yards. A sample of effluent was drawn every eight hours during two cycles of operations. Each irrigation period lasted three days, and the resting period two days. The albuminoid nitrogen varied from ·024 to ·365 parts per 100,000, and the oxygen absorption in four hours from ·34 to 3·46.

The quantity of liquid irrigated and of effluent drained away per 24 hours is given below. The volume of effluent which drained away during the resting period on the 15th to 17th was unfortunately not measured.

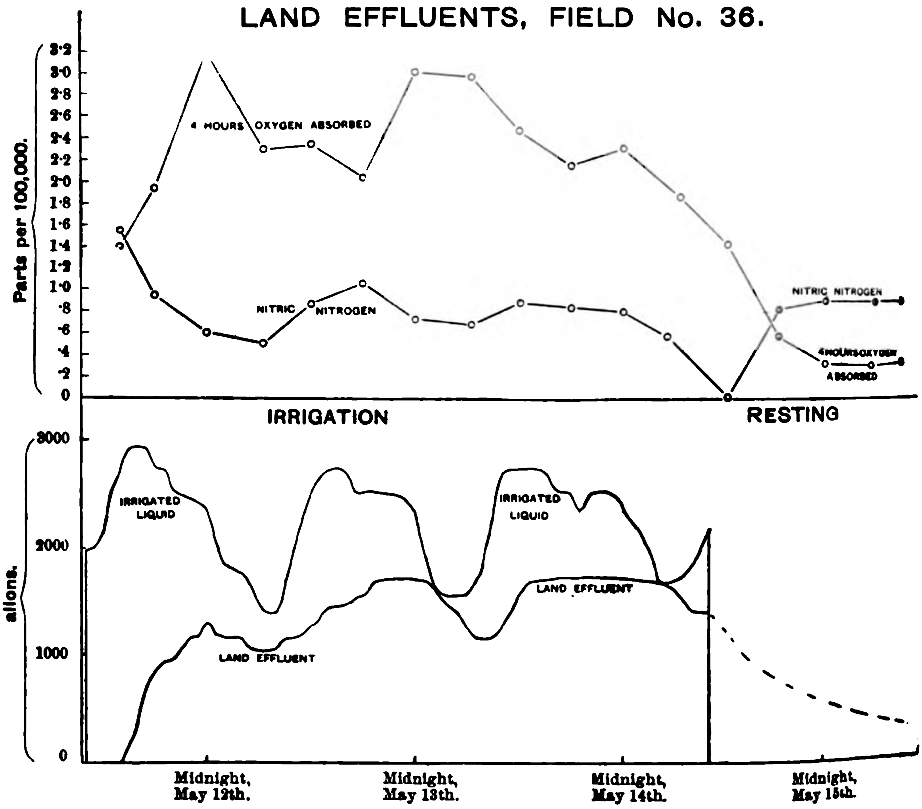


Fig. 3.

Period.	1909.	Volume of irrigated liquid. Gallons.	Volume of effluent during irrigation period. Gallons.	Volume of effluent as a percentage of irrigated liquid.
Irrigation ...	May 12th to 13th ...	53,310	18,910	35·5 per cent.
	„ 13th to 14th ...	55,760	34,440	61·8 „
	„ 14th to 15th ...	55,670	40,210	72·2 „
Resting	„ 15th to 17th ...		Effluent not measured.	
Irrigation ...	„ 17th to 18th ...	42,720	22,820	53·4 per cent.
	„ 18th to 19th ...	42,760	28,310	66·3 „
	„ 19th to 20th ...	53,690	39,710	73·9 „
	„ 20th to 21st ...	50,190	41,600	82·8 „

The total volume of effluent which flowed away during the two irrigation periods was equal to 63·8 °/$_{o}$ of that irrigated (see Figs. 3 and 4).

The fourth series of observations was made on the same plot as the third series, but two years later, in May, 1911, and under better conditions. The flow of the liquid irrigating, and of the effluent draining away, was measured over V notches, and recorded automatically by clock and drum recorders. A sample of the effluent was taken every eight hours, over a period of fourteen days, during which the plot was irrigated and rested, three times. There was a variation from ·34 to 2·08 part

LAND EFFLUENTS, FIELD No. 36.

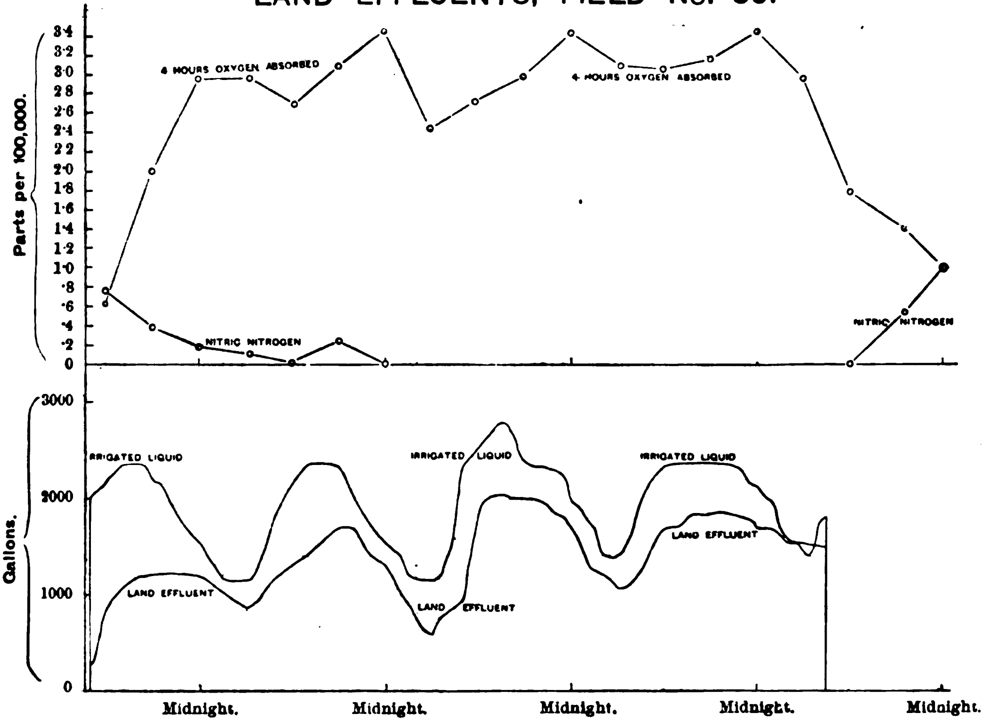


Fig. 4.

per 100,000 on the oxygen absorption in four hours. The curve of flow of the effluent follows the rise and fall in the oxygen absorption figures.

During the first irrigation period of three days, 63,290 gallons of liquid flowed on to the plot of 7,700 square yards, average 2·74 gallons per square yard per twenty-four hours. Whilst irrigation was in progress 27,970 gallons of effluent drained away, equal to 44·2 per cent. of the volume irrigated; during the subsequent resting period a further quantity (7,135 gallons) drained away, equal to 11·1 per cent. of the volume

irrigated. The total volume of effluent drained away during the five days was 35,105 gallons, equal to 55·3 per cent. of the volume of liquid irrigated. During the second irrigation period (two days), 46,246 gallons of liquid flowed on to the plot, equal to 3 gallons per square yard per 24 hours. The volume of effluent which drained away during this irrigation period was 22,228 gallons, equal to 50·2 per cent. of the volume of liquid irrigated, and during the succeeding three resting days a further quantity

LAND EFFLUENTS, FIELD No. 36.

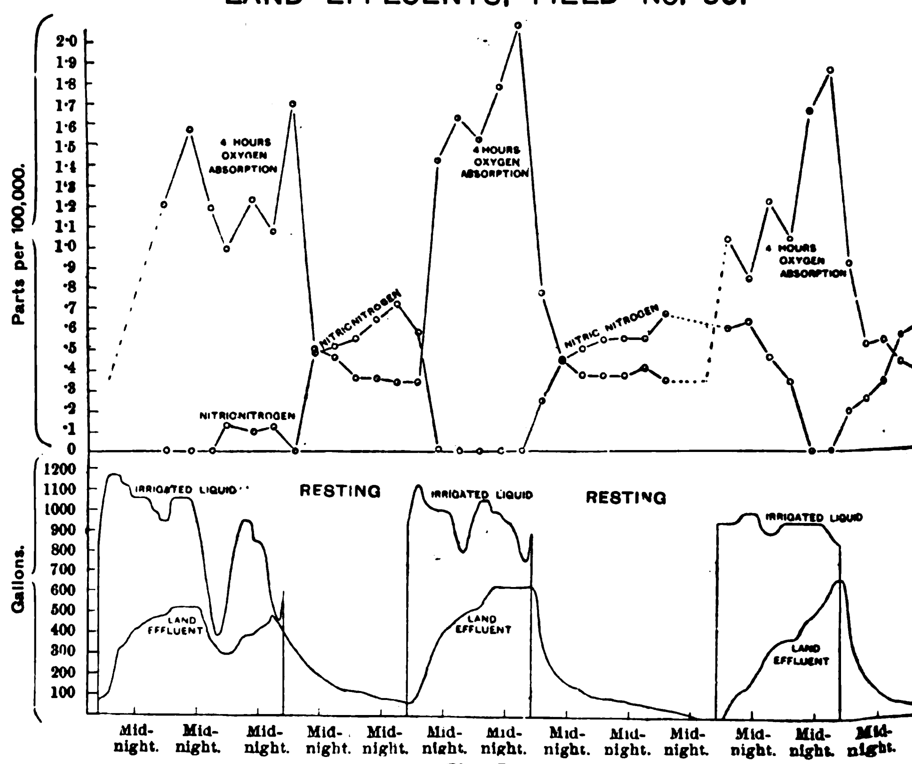


Fig. 5.

of 7,380 gallons drained away, equal to 16·7 per cent. of the volume irrigated; making the total volume of effluent during the five days equal to 66·9 per cent. of the volume irrigated.

During the third irrigation period 45,270 gallons of liquid were irrigated, the average rate being 2·96 gallons per sq. yard per twenty-four hours during irrigation. The effluent drained away during the same

period was 16,355 gallons, equal to 36·1 per cent. of the volume irrigated, and during the resting period which followed, 6,060 gallons drained away, equal to 13·4 per cent. of the volume irrigated. The volume of effluent drained away during the four days was 22,415 gallons, *i.e.*, 49·5 per cent. of the volume of liquid irrigated.

The following table summarises the data relating to the volume of liquid irrigated and the volume of effluent drained away:—

Period.	Day.	Volume of liquid irrigated. Gallons.	Volume of effluent drained away. Gallons.	Volume of effluent as a percentage of the liquid irrigated.	
Irrigation ...	Fri., Sat., Sun.	63,290	27,970	44·2	55·3
Resting......	Mon., Tues. ...		7,135	11·1	
Irrigation ...	Wed., Thurs. .	46,246	22,228	50·2	66·9
Resting......	Fri., Sat., Sun.		7,380	16·7	
Irrigation ...	Mon., Tues. ...	45,270	16,355	36·1	49·5
Resting......	Wed., Thurs. .		6,060	13·4	

The total volume of effluent during the fourteen days was equal to 56·2 °/ₒ of the irrigated liquid (see Fig. 5).

Although the volume of effluent is stated in terms of the volume of liquid irrigated, it is not thereby intended to mean that the effluent which drained away during any cycle, *i.e.*, one irrigation and one resting period, represents that proportion of the actual liquid irrigated during that cycle.

It will be remembered that the soil and sub-soil normally retain from 30 to 80 gallons of water per cubic yard, and that the rate of irrigation is only about 3 to 8 gallons per square yard per 24 hours.

Assuming that the loss by evaporation was fairly uniform from day to day during the period of the observations, it would seem that the liquid irrigating during the first three days helped to increase the volume of effluent which flowed away during the second period of five days, and that the extra days' rest of the second period so depleted the soil that only 49·5 per cent. appeared in the effluent of the third period.

The obvious conclusion to be drawn from the foregoing observations is that a plot of land irrigated with sewage (precipitated tank effluent) by means of distributing gutters may yield an effluent of very varied quality during a normal working cycle.

The volume and quality of the effluent during a cycle of operations is undoubtedly affected by the rate of flow, and the quality of the liquid irrigated during that cycle; there is also the effect of previous cycles to be taken into account.

Where the drains from several irrigated plots have a common outlet, and all the plots are irrigated and rested together, the mixed effluents vary

in much the same way as the effluent from one plot, but if the plots are irrigated and rested on different days, the mixed effluent is less variable.

This is what happens with the combined effluents of a sewage farm. A portion of the effluent, at any moment, is derived from the resting plots, and a portion from the irrigated areas; the relative quantity of each varies from hour to hour. In view of the continuous variation in quality and quantity, it is highly improbable that a chance sample of land effluent will be representative of the average condition of the effluent.

Samples should be taken over a lengthened period, including at least one maximum and one minimum value of organic impurity, and these, as recommended long ago by a Committee of the British Association,* should be mixed in quantities proportional to the flow for analysis. Another, but more laborious, method is to analyse each sample separately, then calculate the average quality, taking into account the rate of flow at the time each sample was taken.

[*For discussion on this paper, see page 501.*]

* British Association Report, 1899.

The Functions of the Non-Bacterial Population of the Bacteria Bed,

by JAMES CRABTREE, B.Sc., A.I.C.

ABSTRACT.

EXPERIMENTS on the lines of E. J. Russell and his co-workers, on the part played by protozoa in soils, have been extended to sewage disposal beds, and have shown the decided effect which removal of the fauna of the bacteria bed has upon its capacity, a bed with no (or very little) animal population "making up" much quicker than a bed with a normal fauna.

The absence of fauna can be the only cause of this observed difference in capacity, as any effect caused by bacteria would be in the opposite direction; for, since the number of putrefying bacteria (those growing on nutrient gelatine) was generally greater in the partially sterilised bed than in the control, the tendency would be for a greater resolution of solid matter in the toluened bed than in the control, with a corresponding increase in the capacity compared with the control. This is contrary to the observed results, which showed a decrease in the toluened bed compared with the control. The difference can, therefore, only be assigned to the animal population, which in some way keeps the bed "open."

Exactly how this is caused cannot yet be said, whether the organisms digest the particles of solid matter, or whether the material is taken up to form the tests or shells of rhizopods, etc., thus modifying the nature of the deposit and allowing the water to run off more freely. There is probably a good deal of digestion taking place, at any rate of the more easily resolvable precipitated colloidal matter. To the eye, however, the most striking difference in the deposits on the bed media is in the physical character rather than the amount, the deposit in the toluened bed being much more spongy and less granular than in the normal bed. That there is a difference in amount is shewn by the following estimation made at the end of the experiment:—

Amount of deposit per 1,000 cc. bed medium (obtained by brushing off into water the deposit from 50 cc. medium, taking an aliquot portion and evaporating dry): * A. bed, 19·2 grams; B. bed, 20·2 grams.

According to these figures there is more deposit per unit capacity of bed in the bed deprived of its animal population.

How much of the difference in capacity is caused by difference in character and difference in amount of deposit must be left to the future

* A is a control bed. B and C beds partially sterilised by toluene.

to decide. The fact remains, however, that the animal population does a good work in keeping the bed medium "open," and, from this standpoint, these inhabitants of the bacteria bed are very desirable.

Outside the effect caused by difference in capacity, what is their connection with the purification processes taking place in the soluble constituents of the sewage? A consideration of the results obtained leads us to say that it is probably very little.

The improvement in the effluent obtained by Russell on a toluened piece of soil, and a similar improvement in a toluened bed outlined in the above experiments may be explained away by the difference in capacities produced in the beds. The fact that in a toluened bed we get a greater number of bacteria capable of growing on gelatine seems to indicate that we should get a greater purification in that bed. The experiments with beds A. and C. (which did not differ in amount and nature of surface deposit, but where C. contained a greater number of bacteria than A.) do not support this idea, for C. gave a worse effluent than A. A comparison of the counts on nutrient gelatine does not of necessity indicate the relative proportions of those bacteria bringing about the purification in the respective beds. Bacteria growing on gelatine are largely putrefactive, while the processes going on in the bacteria bed are largely processes of oxidation.

Müller,* investigating the reduction of bacteria in water samples due to protozoa, finds that although a reduction takes place among the bacteria capable of growing on gelatine, those growing on Heyden agar are practically unaffected. His conclusions are that the protozoa prey only on bacteria foreign to the water (*e.g.*, *B. coli*, *B. typhosus*, and many putrefying bacteria), while the normal population goes untouched. May not this apply in the present case, the protozoa here feeding on the putrefying bacteria carried by the sewage, while the normal oxidising population is unaffected? If the normal population of the bacteria bed is represented relatively by the count on Heyden's albumose agar, a few examinations made in connection with this work would seem to indicate this supposition to be true. A few counts on albumose agar showed differences directly opposite to those in the gelatine counts, *e.g.*,

	Gelatine.	Albumose agar.
Tank effluent	3,760,000 per cc.	1,490,000 per cc.
A. effluent ...	1,720,000 „	920,000 „
B. „ ...	1,940,000 „	760,000 „

which seems to show that an increase in putrefying bacteria causes a

* P. Müller: *Arch. f. Hyg.*, Bd. 75, p. 321: *Cent. f. Bakt.*, 1912, Bd. 35, p. 321.

crowding out of a portion of the normal population with correspondingly worse results in the effluent. From this standpoint can be explained the results obtained in the two sets of experiments (i.) A. and B. beds (before change of capacity in B.) and (ii.) A. and C. beds.

It will be noted that the toluened bed gave a rather larger gelatine count than A., and correspondingly slightly worse results in the effluent. Assuming the increase in gelatine count to mean a decrease in normal bacteria, this would account for the slightly worse results. When with advance of time the toluened bed altered in capacity (compared with A.) the effect of increased area thus obtained outweighed the effect due to decrease in normal bacteria. The author puts this forward at present only as a tentative explanation, not having as yet thoroughly worked out the relation between the gelatine count and the albumose agar count.

Probably, then, in a normal bed the protozoa, etc., satisfy their hunger for bacteria on those brought into the bed with the sewage, and thus allow the normal population to carry out its work of purification. Removal of the protozoa may lead to an increase in putrefying organisms and a consequent decrease in normal population. Thus, removal of protozoa is detrimental both to the capacity of the bed and to its purifying power.

The change in the bacterial population can, however, never become great, as the continual leading on and running off of sewage rich in practically all of the bacteria to be found in the bed must keep the population near normal. It is largely this consideration which leads us to think that the effect of the fauna on the changes occurring in the soluble constituents is not large.

It is not probable either that the animal population influence the soluble constituents directly, *i.e.*, apart from bacteria, by directly feeding on them. It is made up essentially of rhizopods, heliozoa, and ciliates, all of which are generally assumed to feed on bacteria and particles of organic débris. The small flagellates which might affect the soluble matters are not in sufficient numbers to do so.

The conclusion arrived at is, therefore, that the animal population of the bacteria (contact) bed is entirely advantageous; certainly so in maintaining the capacity of the bed, and probably so in keeping down extraneous bacteria and thus assisting purification. At any rate, in the latter case there is no indication that the population is undesirable. Further investigation is, however, needed. Indeed, it was not at first intended to publish these results at this stage, but pressure of other work having necessitated a temporary abandonment of these experiments, it was

considered advisable to make known the conclusions reached thus far, and, if possible, thereby to encourage other observers to make investigations at other works on similar lines. In this way only can reliable information be arrived at, since what may apply to one set of beds may not apply in other cases under different conditions, and with different sewages.

These investigations have been made with contact beds. Probably the effect of the animal population will be more marked in the case of sprinkler beds. In these beds a thin film of liquid is continually flowing over each piece of bed medium, affording more constant and favourable conditions for faunal growth than can be the case in a contact bed where aërobic and anaërobic conditions alternate.

The effect which partial sterilisation of a bacteria bed is found to have on its capacity in these experiments may throw a new light on the practice of disinfection of sewages and effluents. In cases where this is done by addition of chemical re-agents (*e.g.*, bleaching powder) before filtration, it is very probable that the beds used for the subsequent purification of such a sewage will be adversely influenced in respect to the capacity by the killing off of the fauna.

The author acknowledges his great indebtedness to Dr. Gilbert J. Fowler, F.I.C., who proposed this research, and who has followed its course with keen interest, and enriched it with many valuable suggestions.

[*For discussion on this paper see page 501.*]

Preliminary Note on the Bacterial Clarification of Sewage, by

GILBERT J. FOWLER, D.Sc., F.I.C. (FELLOW) and E. MOORE MUMFORD, M.Sc. (MEMBER).

IT will hardly be disputed that the most costly part of a modern sewage works, certainly in capital expenditure, and often in revenue charges, is the filtration area. Just as the difficulty of land treatment of the sewage of large cities forced on the consideration of more compact processes, so these in their turn are becoming impracticable when great centres of population have to be considered. This conclusion was impressed upon the senior author of this paper when called upon recently to report on the proposals of the Metropolitan Sewerage Commission of New York for the disposal of the sewage of that city. This conclusion was shared by his colleague, Mr. J. D. Watson, who reported simultaneously from an engineering point of view.

The area and cost of filter beds depends mainly, it will be found, on the amount of colloidal matter present in the sewage, and much confusion of ideas is probably due to the fact that the ordinary sewage filter, be it contact or trickling, is called upon to do two entirely different things at the same time, on the one hand to oxidise, granulate, and finally discharge as humus the colloidal matters present, and on the other to oxidise and nitrify substances in true solution.

A very open grade deep filter is best suited for the first purpose; a shallow fine grained filter is the most economical for the second. It is true as Dr. Reid has shown in the Potteries that a tank effluent, well clarified by sedimentation can, by accurate distribution, be very efficiently purified on filters of fine material, but even then the area and cost involved when exceptionally large works are under consideration make the problem a very serious one.

For these and other reasons the thoughts of many workers in sewage treatment have been turned to the possibility of more efficient removal of colloidal matter before the filtration process.

Hitherto almost the only practical method has been heavy chemical precipitation. The cost and difficulty of this process when really efficiently carried out (and it should be emphasised that a mere perfunctory addition of a few grains per gallon of precipitant is money thrown away), become very great as the volume of sewage increases. Not only are enormous quantities of chemicals necessary, but the disposal of the vast volume of resultant sludge, without menace in some way to the community, becomes increasingly difficult and costly.

The thought which has been in the minds of the authors has been to

find a method of obtaining a thoroughly clarified effluent without the use of large quantities of chemicals and with the minimum production of sludge.

By a thoroughly clarified effluent is meant one which will not eventually deposit solid matter either on the bottom of a stream into which it flows, or in the interstices of a bacterial filter.

It is clear that in a sewage filter a combined oxidation and coagulation of the colloidal matter must go on, resulting in the production of the so-called residual humus, which either is collected in humus tanks, or is periodically washed out of the medium.

If this oxidising and coagulating process could be brought about by suitable open tank treatment before the filtration process, it is obvious that the latter could be enormously accelerated, if not dispensed with altogether, and the whole operation of sewage treatment could be conducted on a much smaller area.

In the course of a research on another matter, one of the authors* had occasion to study the reactions of an organism occurring in Nature in pit water impregnated with iron. This organism, which for convenience has been designated M7, is a true facultative organism, preferably an aërobe, and exercises a specific action on iron solutions.

The action of the bacillus on iron solutions proceeds in two stages, in which the aërobic and anaërobic actions appear to be symbiotic, at any rate under the conditions occurring in Nature. The aërobic action is to precipitate ferric hydroxide from iron solutions; while the anaërobic action is to transform the hydroxide thus precipitated into bog ore, with partial reduction of the iron to a ferrous state. It was found that in order to precipitate the iron sufficiently the organism required a certain proportion of albuminoid organic matter. It was therefore natural to expect that ordinary sewage matter could be utilised in this way. Experiment, in fact, showed that a sewage effluent could be effectively clarified in this way when acted upon by this organism in presence of small quantities of ferric salts, aërobic conditions being maintained in the liquid by means of a current of air.

The process, therefore, by which it is proposed to clarify sewage, is in the first place to remove the grosser solids, either in a plain sedimentation tank, an Emscher tank, or a Dibdin slate bed, in such a manner as shall give rise to the least amount of putrefactive change in the liquid portion of the sewage.

The effluent from this preliminary process would be led into a second tank, where it is inoculated with the organism, a small dose of ferric salt is added, and air blown through till clarification sets in. A period of

* Mumford, Chemical Society *Transactions*, 1913, p. 625.

settlement is then allowed for precipitation of the coagulated matter, and eventually the clear liquid is run off, either for rapid final filtration or for direct discharge into the stream. The precise mode of action of the organism is not yet fully worked out, but it seems likely that simultaneous precipitation and solution takes place, some of the organic matter being converted into amido derivatives, and some being coagulated and thrown down with the ferric hydroxide.

The ordinary methods of sewage analysis fail to reveal the change which has really taken place during this process, as they do not differentiate between organic and nitrogenous material in the colloidal and crystalloidal states respectively. It should be pointed out that a fairly strong solution of amido acids, which are the end products of protein degradation, is not necessarily putrefactive, though those acids require oxygen for their final conversion into nitrate.

A recent unpublished research by Mr. R. M. Beesley, a co-worker of the authors, has shown that there is no great difference between the rate of oxidation of substances such as uric acid and glycin, and simpler bodies such as urea.

It may be anticipated, therefore, on all grounds, that the clarified liquid resulting from the process as above described can be oxidised at a very rapid rate.

As the conditions during the process are maintained, as far as possible, aërobic throughout, and there is always a certain amount of ferric hydrate present to oxidise offensive sulphur compounds, it is not anticipated that the aëration can give rise to nuisance, and none has been observed in laboratory trials where these conditions have been fulfilled. Experiments in the laboratory with quantities up to four litres have shown that it is possible to clarify a strong fæcal emulsion in this way.

A limpid, sparkling, and non-putrefactive effluent was obtained from domestic sewage drawn from a sewer near the laboratory. Ordinary tank effluent from the Manchester Corportion sewage works at Davyhulme has been rendered non-putrefactive on incubation. So far only approximate estimates can be given of the amount of iron salt required and the duration of the blowing process. Experiments would indicate that one grain of iron-salt per gallon is the maximum need, and that a total of twelve hours tankage, *i.e.*, six hours aëration and six hours settlement, will be sufficient.

As regards the inoculation of the organism, once the growth has been established in a tank there appears to be no difficulty in maintaining it. The fact that large bodies of water in the old colliery workings at Worsley, near Manchester, are teeming with the organism, is sufficient evidence of its vitality. An experimental plant has been erected at the University of

Manchester, which will permit accurate observations of this process to be made, and sufficient data to be collected to serve as a basis for work on the larger scale. It is already evident that the conditioning factor is the cost of an air blast; the pressure of air will, of course, depend simply on the depth of water to be blown through, and a number of engineering conditions will naturally affect this part of the problem.

It is reasonable to suggest that much of the power required could be obtained on the one hand from gas collected from the fermentation of the main bulk of the sewage solids, either in Emscher tanks or by some kindred process, or the fall available from the aërating tank might often admit of the water-head being turned into power.

In any event the authors believe that they are justified in bringing the idea forward at this Congress in order that it may be discussed from different points of view.

Experiments on the aëration of sewage in different ways have of course been made by different observers; Dr. Dupré and Mr. Dibdin in Vol. 2 of the Report to the Royal Commission on Metropolitan Sewage Discharge, in 1884, describe a large number of experiments on the aëration of London sewage. In 1888 Mr. Hartland, in conjunction with Mr. Kaye-Parry patented an aëration chamber for purification of tank effluent. In 1892 Mr. Sydney R. Lowcock conducted experiments on the aëration of filter beds by a forced air supply. Dr. Adeney's long series of careful researches have thrown great light on the chemical changes occurring when sewage is completely oxidised by prolonged aëration. In 1897 one of the authors carried out extensive experiments on the aëration of tank effluent under various conditions, and recently Messrs. Black and Phelps have carried out a number of experiments on the aëration of New York sewage, while the subject is also being studied by the chemists of the Massachusetts State Board of Health.

The advance claimed in the present communication is the use of a specific organism found in nature, together with iron salts, to effect the clarification of the effluent, that is, the coagulation of the colloidal matter as distinct from the purification of the effluent taken as a whole. To use a simple illustration, the addition of a little rennet does not appreciably alter the composition of milk as a whole, but separates it into a solid and liquid portion. The endeavour of the authors has been to obtain a similar result in the case of a sewage tank effluent: to collect the precipitated colloids, and purify the liquid portions by high speed filters, or it may be in large tanks stocked with suitable aquatic plants.

[*This discussion applies also to the papers by* PROF. E. A. LETTS *(pp. 453 and 464)*, MR. A. J. MARTIN *(p. 469)*, MR. J. P. WAKEFORD *(p. 475)*, MR. J. E. PURVIS *and* DR. A. E. RAYNER *(p. 479)*, MR. WILLIAM CLIFFORD *(p. 485)*, *and* MR. JAMES CRABTREE *(p. 493)*.

DR. W. E. ADENEY (Dublin) remarked that he had read Prof. Letts' paper with much interest, as he was well acquainted with the Bristol Channel, having had occasion very carefully to examine it at various points from time to time. He fully concurred with the opinion expressed by the author in the opening portion of his paper, to the effect that the peculiar features which obtained along its northern coasts rendered the Bristol Channel peculiarly well fitted for the disposal of large volumes of sewage in a satisfactory manner. Prof. Letts had performed a valuable service to engineers and to chemists in describing his particular experiences in the Bristol Channel. So much prejudice, and so many ill-founded opinions, had been, and were still, expressed against the disposal of crude sewage by discharge into sea-water, however favourably circumstanced, that it was advisable that all cases of successful disposal of sewage from sea outfalls should be carefully recorded. As a matter of fact, there were some points along the northern coast of the Bristol Channel the physical features of which, as regards coast contour and tidal currents, were so favourable to the rapid dilution of sewage matters, and to their rapid transport to open water, that very large volumes of sewage matter could be discharged from them without the slightest danger to the amenities of the tidal waters or of their adjoining shores. Prof. Letts was one of the first of modern workers to emphasize the importance of the information to be gained from a chemical examination of the material of the bed of a water-course in relation to the question of the efficiency or non-efficiency of the disposal of sewage matters discharged into it; and he had very properly given it a prominent position in his paper. Indeed, a careful examination of such material would afford satisfactory evidence as to whether an existing system of disposal was satisfactory, or whether a change should be made, and the sewage, before discharge, be subjected to some treatment for the removal of the heavier portions, or of the whole, of its suspended solids; or even for the removal of a portion of its dissolved impurities, or, possibly, whether a more suitable point of discharge should be selected. In the case of the choice of a new point of discharge, the physical conditions of the material of the foreshore, if close to the point selected, might also afford very valuable information; *e.g.*, if the selected point was within the influence of a true tidal current, and the tidal currents were sufficiently strong to scour the adjoining foreshore free from mud and fine sand, and if the direction of the tidal currents also gave promise of their effecting a rapid and sufficient dilution of the sewage matters, no doubt need be entertained as to the possibility of the selected site proving suitable for the purpose in view. As regards the dangers of the nuisance being indirectly caused by the

discharge of sewage matters into tidal waters, from excessive growths of undesirable weeds, such as the *Ulva latissima*, Dr. Adeney desired to point out that there no longer existed any doubt as to the causes which brought about excessive growth of such undesirable weeds. Thanks to the thorough and careful manner in which these had been investigated by Prof. Letts, they could now foretell with certainty, having a full knowledge of the local conditions, whether the discharge of a given sewage from a proposed point in a tidal way would or would not be subsequently attended by a nuisance arising from excessive growth of undesirable green weeds; or point out, in the case of any doubtful features in the local circumstances, when the results should be regarded with uncertainty.

Mr. John D. Watson (Birminghan, Tame, and Rea District Drainage Board) said it was impossible for them to appraise the value of the excellent work Professor Letts had rendered to the community by the studies and reports which he had made on the effects of sewage pollution on sea-water. The reports which he and Dr. Adeney made to the Royal Commission were now classical, and the papers Dr. Letts had just submitted to the Institute were equally helpful in forwarding a sound understanding of the pollution question. It was to such papers that they were indebted for the prospect of speedy emancipation from a statute law which no community could obey, and which by its absurdity had kept back progress. He referred to the 17th section of the Public Health Act.

Their ideal should be to avoid pollution by suiting each effluent to the needs of each stream. If a chemist of Dr. Letts's reputation told them that an effluent of a certain standard would not prejudicially affect the purity of the Usk, why should the engineer spend an additional £50,000 in order to produce a higher-class effluent? To his mind it would be unjustifiable. The predominating factor in the recommendations of the Royal Commission on Sewage Disposal was the recognition of this principle.

He admitted that it was essential to take all the papers together that day, but it had the effect of confining one's criticism to ten minutes. In that time it was impossible to do the writers justice, as the papers were all good. Mr. Martin's advice was sound; nothing was more clear than the necessity for all who were engaged in sewage purification to walk warily. Discoveries had to be tried and tested by time before it was prudent to pronounce judgment upon them. In his view this applied to the paper Dr. Fowler had read that day, which he thought was one of the most suggestive papers he had heard for a long time; but he had found on many occasions that laboratory experiments did not work out in practice, and he was very doubtful as to whether it was economically practicable to eliminate colloidal matter by aërating sewage. That it was physically practicable Dr. Fowler had shown. This phase of the purification question was not altogether new. It had in a minor degree engaged their attention at New York, and the President of the Metropolitan Sewage Committee was favourably disposed towards it, but he (Mr. Watson) thought elimination and disposal of

solids would leave the New York sewage so weak that it might safely be discharged into the outer harbour. Dr. Fowler, who was associated with him in advising the New York people, took a similar view.

Mr. Clifford's paper was very interesting. He could not have believed that such a variety of effluents would have been emitted by land under normal irrigation conditions, and the facts thus obtained emphasised the unwisdom of establishing a statutory standard or any other cast-iron standard which overlooked such material conditions. It was gratifying to get cost figures from Mr. Wakeford. It was generally observed that engineers avoided giving costs at a congress, Mr. Wakeford had shown that he was not afraid to do so.

MR. A. P. I. COTTERELL (Westminster) said the Bristol Channel, with its confluent rivers, offered a particularly favourable example for the application of the principles enunciated in the Eighth Report of the Royal Commission on Sewage Disposal. That report, it would be remembered, established in some respects an epoch in the problem of sewage disposal, in that it set up as a dominant factor a standard of dilution or diffusion, and modified the part to be played in what might be called the artificial process of purification according to the amount of dilution that could be obtained. Thus, the Royal Commission concluded in their final report on water-borne sewage that, in fixing a standard applicable to the particular case, the dilution afforded by the stream was the chief factor to be considered. They went on to say that with a dilution of over 500 volumes all tests might be dispensed with, and crude sewage discharged subject to the provision of screens or detritus tanks. When the dilution was less than 500 volumes, a relaxation from the general standard might be made down to a limit of 100 volumes. These conditions completely modified the attitude that up to now had been adopted towards sewage purification, no matter what the channel or river into which the effluent was discharged. In other words, the Commission stated that the actual circumstances of each particular case must be taken into account, and no one cast-iron rule could be applied to all. As a matter of fact, this was common sense. Whether the existing law justified it or not, it appealed to them, and upheld the view that many engineers had long maintained, and that some towns situated like those on the Bristol Channel and its tributaries had for many years carried into effect. The drainage area of the Severn and its tributaries above Newport was about 8,560 square miles. On a very moderate basis of flow-off this must give an average discharge of over 450,000,000 cub. ft. per day into which sewage from possibly 2,000,000 was discharged mostly at or near the mouth of the Severn. A discharge of 30 gallons per head would give a dilution rate of only about 47 volumes, but when they added to the river discharge the enormous quantity of sea-water that flowed twice a day up and down the estuary, they saw that there was a dilution far beyond the maximum limit set by the Royal Commission. They had also the fact of exceedingly rapid ebb currents, approximating in some parts to five or six miles an hour, all of

which helped toward complete dispersion of the sewage in the diluting water. If they considered one or two of the main tributaries upon which large populations existed interesting results were obtained. Mention was made by the author of the paper of the Usk. Here they had a river basin of about 540 square miles, with a discharge on the 33⅓ per cent. basis of 28,000,000 cub. ft. per day. It received a sewage flow near its lower end of quite 600,000 cub. ft. per day, beside the effluent, more or less purified, from the somewhat scattered towns and villages on its higher reaches. Conceding that before it became tidal it was in a fairly clean condition, taking up, say, not more than three parts dissolved oxygen in five days, even then, if the river flow only were considered, the effluent would require to be a very good one to come within the standard laid down by the Royal Commission, seeing that the dilution with river water was only about 46 volumes. But they had not considered the enormous tidal volume delivered into the estuary twice a day, and when this was brought into account the position was altogether altered. They then had a dilution just above Newport of well over 1,000 volumes of sea and river water on the present population if the sewage was discharged upon the ebb-tide only, while below Newport, where the estuary enlarged, it could not be less than 700 volumes. These deliveries were beyond the limits laid down by the Royal Commission, within which complete purification was required. The case was not quite on all fours with the suggestions of the Royal Commission, because they evidently fixed their limits of dilutions on the basis of a flowing stream, whereas this obtained its dilution from a mass of tidal water that filled the estuary like a basin and receded twice a day. It was needful to see that the same tidal contents did not have to act as a dilutant again and again, and for this purpose it was fairly obvious that the discharge must be regulated, and the position of the outlet be such that the ebb might practically take the diluted sewage out to sea into a still larger diffusion before the tide turned. They had also to bear in mind that sea water had not the same oxygen absorption by 20 per cent. as fresh water, and allowance should be made for this. A still more interesting tidal tributary from the point of view of sewage dilution is the Bristol Avon. Here they had a river basin of 832 square miles for the Avon proper above Bristol, and 68 square miles for the Frome which joined the Avon at Bristol, making altogether an area within the watershed above Bristol of 900 square miles. The average flow-off from this area on the basis of 33⅓ per cent. would be about 48,000,000 cub. ft. per day. The sewage from a population of nearly 400,000 persons was discharged at Bristol in an absolutely crude condition into the tidal portion of the river, which, in its non-tidal or up-country course, dealt with the sewage effluent from a population of probably nearly 200,000 persons, and could not be looked upon when it reached Bristol as even a fairly clean river. The same remark applied to the Frome. Bristol discharged its sewage at all states of the tide from twelve outlets, the chief one at present being on the right bank just below the well-known Clifton

Downs. The only limitation to the flow, if limitation it be, was the provision of tidal flaps that were supposed to open only on the ebb tide, the sewer during flood tides being used as a storage tank. The dry-weather sewage flow might be taken to be nearly 2,000,000 cub. ft. per day, that was to say, there was a dilution with river water of about 12 volumes. This dilution of itself would not be sufficient to prevent an intolerable nuisance, but here again the tidal dilutions came to the aid of Bristol. The tidal contents of the Avon was about 600,000,000 cub. ft., the contained water at high tide being obviously partly salt and partly fresh. This quantity was sufficient to give a dilution of 600 volumes reckoning both tides, and very much modified the requirements of purification. At the same time it would be seen that the method, or rather want of method, adopted by Bristol of discharging the crude sewage unstrained and at all states of the tide, except to the limited extent afforded by the tidal flaps, was not sufficient to meet the needs of the case. This point was still further emphasised by the result of float experiments, quoted by Mr. Ashmead, the late borough engineer, in 1878. He stated that floats sent off from the sewer outlets two-and-a-half hours after high water of spring tides went as far down the Severn as Portishead, but returned to the starting-point with the flood tide in four-and-a-half hours. Similar floats, however, sent off on the neap tide did not get out of the river at all before the tide turned. It was obvious that if the contents of the river on each tide received more than their share of sewage (did not, in fact, come fresh to the work), the rate of dilution was brought far below what it ought to be for a crude sewage discharge, and it was therefore not surprising to find that Bristol had for long contemplated the construction of a trunk sewer to more ample tidal waters, like Cardiff and some of the Glamorganshire valleys had done. Either this or a limited system of purification sufficient to enable the tidal water to dilute the effluent seemed to be called for at no distant date. Situated as the Welsh valleys were within so short a distance of tidal waters, where there was any amount of dilution, it was not surprising that the teeming populations had taken advantage of the fact to get rid of their sewage in a place where it could give neither them nor their neighbours any more trouble.

PROF. LETTS said that as to the amount of nitrogen in *Ulva latissima*, it varied considerably according to whether it came from a polluted or unpolluted district. Where it came from pure sea water they found a little over 2 per cent. of nitrogen, whereas when it was taken from a polluted district it contained as much as 6 per cent., which showed that it absorbed considerable quantities of nitrogen from sewage.

THE PRESIDENT OF THE SECTION (Mr. H. Percy Boulnois): Would you, then, encourage the cultivation rather than the destruction of the seaweed? You think it is doing more good than harm.

Prof. Letts: Yes; and I have suggested it could be used in an aquatic sewage farm.

Mr. T. J. Moss-Flower (Westminster and Bristol) said there was little of a controversial nature in the papers submitted. He agreed with the suggestion on the part of Mr. Martin, that a Government department should be appointed to carry on the interesting and valuable work that had already been, and was still being, done by the officers of the Royal Commission on Sewage Disposal, and by private enterprise.

Reference had been made to the vast sums of money alleged to have been wasted in erecting sewage disposal works. This, in many instances, was not money entirely thrown away; it had to some extent made for progress.

In this connection, whilst it was desirable that due economy should be observed, it was not possible to wait for indefinite periods, nor until the last word had been said on sewage disposal.

The sewage problems had to be dealt with in accordance with the law as it existed, and those whose duty it was to deal with these matters could not wait for new laws, and until unthought-of methods had been evolved.

The discovery of the new bacillus M. 7, and the experimental plant designed for facilitating the use of the organisms in clarifying the sewage, was most interesting; and if the continued researches of Prof. Fowler and his colleagues proved that the system could be successfully and economically applied on a large scale, it would lead to a great advance.

Mr. G. P. Harvey (Copenhagen) said he should like to ask Dr. Fowler for further information on several points in connection with his most original and interesting proposals for the elimination of the colloids. He would like to inquire whether the colloidal matters deposited, which seemed to correspond to the humus tank deposit of ordinary installations, were subjected to further treatment before removal for use as manure or otherwise.

Dr. Fowler, in the course of his remarks, had promised to give further details of the rapid roughing filter. What was the grading of the material in this, and the flow treated per square yard? What was the nature of the humus retained by the small ten-minute tank after the filter? Dr. Fowler had spoken of this hardy iron-precipitating organism as probably abundant in the bog-ore swamps of Sweden and Norway. This was of special interest to the questioner, because his field of work lay in those countries; and perhaps Dr. Fowler would enlighten them as to in what form the presence of the organism manifested itself under such circumstances.

Apropos of new sewage treatment methods, the speaker had called at Dr. Dunbar's Institute of Hygiene on passing through Hamburg, and his colleague, Prof. Kister, had spoken of a new method of disposal tried at München by Prof. Hofer, where, after preliminary sedimentation, the sewage was diluted three or

four times with river water and passed through carp ponds. The even distribution and spread of the flow throughout the ponds, and the presence of the proper fauna, were essential features if the process were to be successful. The carp were sold for consumption. With regard to pathogenic organisms, Prof. Kister considered there was no need for apprehension in this respect, as the fish were not consumed in the raw state, like our much maligned molluscs. The speaker did not suggest that the process was entirely original, but thought that the running of the diluted sewage direct to the fish-ponds without previous filtration was a new proceeding. The process was admittedly only adaptable under special circumstances, and he did not anticipate it would find favour in British practice; but was, nevertheless, interesting, and further evidence in justification of Mr. Martin's plea for freedom from hard and fast regulations from the Local Government Board for sewage treatment in the future.

Mr. Crabtree's conclusion that worms did not form a considerable part of the non-bacterial life of sewage filters was contrary to his experience. Having had occasion recently to overhaul both contact beds and a small trickling filter, which were in a healthy condition, he had found the clinker in both cases, especially the coarser material, so to speak, honeycombed and teeming with large worms, which, without doubt, contributed their quota to the purification effected by the filters.

DR. MILLER (Hereford) referred to the importance of taking into consideration the bacterial quality of the effluent passing into a river from which certain towns derived their water supply further down. The results obtained by Mr. Purvis and Dr. Rayner in experiments in connection with the River Cam were not in accord with the results obtained by the late Sir Rubert Boyce and others in experiments in connection with the River Severn, on behalf of the Royal Commission on Sewage Disposal. They found that bacterial contamination could be detected at least fifteen miles from the point at which sewage passed into the river; at that point another effluent passed in. It was most important that further research should be made on this matter, and that further consideration should be given to the question of bacterial standard of effluents passing into rivers from which towns derived their water supplies.

THE PRESIDENT OF THE SECTION (MR. H. P. Boulnois) closed the discussion, and said that, without depreciating the other papers, he considered that Dr. Fowler's paper was original, and emanated from a man who was always at work making investigations into sewage. He would ask him to explain a little further the making of his proposed ferro-aërobic tank.

DR. GILBERT FOWLER (Manchester) described the laboratory plant in detail. Sewage was pumped from the laboratory drain into a mixing tank, where water was added, and a supply of sewage of moderate strength thus obtained. This

tank held about 100 gallons. This sewage passed through a settling tank to remove the heavier particles which would normally form sludge. The turbid liquid, freed from appreciable visible solids, then passed into the blowing tank (previously inoculated with the organism), where it received a small dose of ferric salts, and where air was blown through.

The liquid took about six hours to pass through, and a further six hours to pass through the next or clarification tank. From this it passed on to a roughing filter operated at the rate of 3,000,000 gallons to the acre yard.

The final effluent, after a few minutes' settlement, was almost limpid. This final effluent did not deposit any appreciable quantity of solids subsequently, under whatever conditions it stood, and was also non-putrefactive. It was probable that in practice the roughing filter would not need to be so large, or, by increasing the clarification tank, it might be eliminated altogether.

The action seemed to be to convert colloidal into what Dr. Travis would call particulate matter, a certain proportion at the same time going into true crystalloidal solution. This particulate matter could be filtered off at a very rapid rate, just as a granular precipitate filters quickly in the laboratory.

The great economy in area effected by the process could be judged from the fact that, even with the actual dimensions used, it would mean that the area of primary contact beds at the Davyhulme Works of the Manchester Corporation could be cut down by one-half, with production of an effluent which would not clog secondary filters. The crux of the problem was the cost of aëration. This must of course depend on the method of application of the air, and it was a problem he submitted to the engineers. The maximum required in the experiments was one cubic foot per square foot per minute, but this could certainly be reduced. It should be noted that the air was not blown in with the object of completely oxidising the sewage, but only for keeping the liquid in motion and maintaining the life of the organism.

The experiments, as the title of the paper suggested, were preliminary only, but the process was now before them, and the details would have to be developed later.

Photo. Elliott & Fry

SIR WILLIAM H. PREECE, K.C.B., F.R.S., M.INST.C.E.,

Member 1899. Fellow 1901.
Vice-President 1901 1913.

President, Congress at Southampton 1899.

Volume XXXIV. No. 11. Issued December, 1913.

JOURNAL

OF

THE ROYAL SANITARY INSTITUTE

CONGRESS AT EXETER.

SECTION C.—DOMESTIC HYGIENE.

Presidential Address, by THE MAYORESS OF EXETER (Mrs. H. W. MICHELMORE), President of the Section.

THE WELFARE OF THE NATION LIES IN THE HOMES OF THE PEOPLE.

WE are met together to-day to consider from different standpoints the very important subject of domestic hygiene. The homes of the people are the training grounds of the future generations; and the health, order and comfort of these are essentially in the hands of the women of the nation. Roughly speaking, our homes fall into two classes: those of the urban, and those of the rural districts. I stand before you in a dual capacity, primarily as representing the women citizens of Exeter, in whose name I accord you a hearty welcome, and secondarily as representing the women of the smaller and more primitive rural districts, in one of which I reside. These two classes of homes have to contend with quite different kinds of difficulties, and it is hoped that our deliberations and discussions here will show us more clearly how best to deal with these difficulties in the future, and how to work steadily and persistently towards the attainment of the *mens sana in corpore sano,* which is essential to healthy national life.

The question of domestic hygiene is of supreme importance to both rich and poor; and yet in some, even of the larger homes in our land, there is a lamentable lack of cleanliness, and an appalling amount of food

waste, which is anything but hygienic. In my own experience I have seen a country mansion, in which a sale was about to take place, where the kitchens and the servants' quarters were in such a condition of neglect and dirt that the wonder is that any member of the household was healthy, and one can only attribute this to the purity of the air. The remedy for such a state of things lies in knowledge, coupled with energy and resolution to apply it when acquired. I would advocate a return in measure to the old-fashioned method of education by which every girl, of whatever rank in life, was instructed in the management of the home and in the care of the sick. It is astonishing to find how little the ordinary woman of the present day knows about such things. And here let me commend to you the work of the British Red Cross Society, which through its recently-formed Voluntary Aid Detachments insists on the members studying and passing examinations in the rudiments of sick-nursing and cookery.

We are glad to know that in various parts of the country, schools of domestic science are springing up; that girls are yearly becoming more interested in, and anxious to take up the course of training offered by them, and are making it their business to learn, what in many cases will be their principal duty in life, *i.e.*, that of "home-making," than which none higher exists.

If we turn for a moment and consider the homes of those in a humbler sphere of life, we find much the same deplorable ignorance, but at the same time there are bright exceptions, and signs that we may expect better things in the future. Who cannot picture to herself the wife of a working man, living in her narrow circle "of the trivial round, the common task," doing her best to keep the home clean and bright, the children well nourished, well clothed, and well mannered, rarely allowing herself a day's pleasure, but all unconsciously contributing more largely to the welfare of the nation than her more fortunate sister, who has time to go here and there, perhaps even speaking on public platforms, or otherwise employing herself for the benefit of her generation?

"The growing good of the world," says George Eliot, "is partly dependent on unhistoric acts; and, that things are not so ill with you and me as they might have been, is half owing to the number who lived faithfully a hidden life, and rest in unvisited tombs."

Again we see signs of progress in the elementary schools since subjects such as personal cleanliness, house work, and simple lessons on hygiene were included in the regular course of instruction. Surely this is a step in the right direction. In one school in this city I distributed last

Christmas about a dozen hair brushes and combs to the girl prize-winners, the prizes taking this form at their own request.

This subject of cleanliness naturally leads to that of water, and here the urban districts are far in advance of the rural. Every self-respecting town in this country now possesses a good and ample water supply; public baths and washhouses are provided, and every facility is afforded for cleanliness in the homes. Such, however, is not the case in our rural districts. Many of them are now in the same condition as they were in several generations ago, even if they have not become worse, and the difficulty of improving matters is rendered well nigh impossible by the bitter opposition of the parish councils to any scheme for the introduction of a pure and wholesome water supply, lest it should increase the rates. Here the Law offers its assistance, and in due time with due patience our smaller communities will have the same facilities for cleanliness as the larger ones.

The food consumed by both rich and poor also leaves much to be desired from a hygienic point of view. The proper function of food is to supply nourishment to the body in a palatable and digestible form; but who can say that the *tinned foods*, now so much in demand by all classes, carry out this requirement? We must, forsooth, have *white bread*, with most valuable parts extracted from the flour, with the result that our children are toothless and anæmic; and we prefer *sago* manufactured out of pure starch because it is white, to the genuine article with all its nourishing properties which make it somewhat brown. Fortunately the Law protects us from more than a certain amount of *adulteration*. Now if every "home-maker" would make a point of using as far as possible only food materials which she believed to be pure and fresh, and of studying the outlines of the chemistry of food, together with the reasons for the different methods of cookery, she would probably find her doctor's bill reduced to a minimum. She should make it her business to offer her family simple and well-balanced meals containing a due proportion of the materials essential to the building-up of the human frame, and to do this she must of course know the component parts of each dish, and how it can best be cooked, using the method which is at the same time economical, nourishing and palatable. Variety in diet must also be studied, and what is sacrificed in one dish to attain this object must be supplied by another.

It would also be a great gain if mothers of children in the elementary schools could be induced to provide, as many of them can, regular meals at stated hours instead of the everlasting white bread and glucose jam so commonly given at odd hours during the day.

The conclusion at which we arrive seems to be that the well-to-do often pay unnecessarily for what is comparatively of little value, whilst the poor could be equally well nourished at much less cost by means of herrings, cheese, beans, peas, lentils and such-like foodstuffs, the value of which seem to be unknown to them, whereas their cheapness should make them a favourite form of food. I think fashion is to blame in this case in large measure.

When cleanliness, good water, and wholesome food are the order of the day, and when we have learnt to make use of fresh air in our homes, the battle will be won; but this day is not yet. Open windows are not yet popular; we think we catch cold, and some of us are still scantily clothed, but those who are enlightened on this point can set the example, and by degrees our slow-going public opinion will be educated in this matter as it has been, and is being, educated on many others equally important. But those who care must acquire habits which will act as object lessons to those around them; this is the quickest and surest method of teaching, and can be practised by everyone. Those of us who have experience can be ready and willing to give advice to our younger sisters, the condition of our own homes will justify our doing so; if the inmates are healthy, happy and contented, we shall be amply repaid for time, thought and service spent on them.

In conclusion, may I quote some words carved on the wall of one of the rooms in the Tower of London, by whom no one knows: "*Vivre sans rêve, qu'est-ce?*" Do some of us dream of a day in the far distant future when our nation shall be sane, thrifty, and contented? Then let us not be satisfied with dreaming, but let us work towards the realisation of that dream by gaining all the knowledge and experience we possibly can, and then by example, which is better than precept, applying it with sympathy, tact, and above all with love.

Labour-Saving Contrivances, by Miss E. P. Hughes.

IT is worth while for people to spend much time, thought, and money in inventing and in utilising labour-saving contrivances for the home. It matters to everyone that this should be done, because labour-saving contrivances will make a better home, as I hope to show. And it matters especially to women, for this will give home-makers time for the higher parts of home-making; it will make their work more interesting and more intelligent; and it will give them, what is essential to a satisfactory life, (and what most home-makers do not possess at present) *a good margin of leisure.* I contend, therefore, that my subject has great hygienic, economic, intellectual, and moral importance.

I have been slowly driven to believe that the deepest impression made on average human beings during life is produced by the way in which they *do* the work by which they live. And this is not to be wondered at, when we remind ourselves of the years expended on it, and the time and energy absorbed by it. Please note I did not say the *work* but the way in which the work is *done*, because I see the same work raises one, while it sinks another. In my own profession, for example, I have seen teachers made each term more narrow and inelastic, more stupid and less capable of learning; and I have seen others raised each term they teach, by the same work, to a higher platform, a wider horizon: really being educated by educating. It means everything the way in which we work, and this is largely effected by two things. Firstly, our *attitude* towards the work, and this partly depends on our success in the work, and labour-saving contrivances will enable us to do better the work of home-making. Secondly, the *conditions* under which we work; and good conditions certainly include proper leisure, and labour-saving appliances will tend to give us this.

Now, let us think of women's work: home-making. This is obviously the largest trade or profession in the world; and because of the nature of this trade, it is of profound importance to the world that it should be done *well;* and because it absorbs such an enormous proportion of women's time and energy, it is of the greatest importance to them that it should be done well, and with pleasure to themselves, and that the effect on them be good and not bad. Now I confess, and probably I am making many enemies by so doing, I think that at present home-making is very badly done. I once heard an irritated husband remark to his complaining wife, "My dear, my dear, if I managed my factory as badly as you manage our home, I should be ruined in a month." He was probably correct, but

the wife had the more difficult work to do, and she probably had received no training for it. Little wonder that she failed! I quote from a recent newspaper:—

> "Woman is pre-eminently the trainer of children. We are faced by the terrible fact that 110 children out of every 1,000 born die in the first year of life. In no other industry in the world would such wastage be tolerated."
>
> "In the home woman reigns supreme, and is there any other spot on earth that has been so little touched by invention and by ideas? Is there any other business in which there is so much unorganised wasted effort?"
>
> "The common complaint of woman is that work in the house is never done, but there seems to be no conception that this ought not to be the case. She has not succeeded in making work in the house, which ought to be a most attractive one to other women, sufficiently enticing to prevent a great influx to the factory, the shop, and the typist's desk, rather than to the life of a servant. She has not succeeded, precisely because her work is never done, because there is no organisation, because labour-saving possibilities are ignored, because in short she does not know her business."

And where a home is relatively healthy and comfortable it is often made so at the cost of an over-worked home-maker, who with but little leisure must necessarily fail in the higher part of home-making. How can she be a real companion to her husband, a friend to her growing children, a social queen, when she has no time to read, and little time to think? Leisure is exceptionally necessary when the life-work is of a tiring nature. The home-maker has to undertake the heavy burden of motherhood, the anxious care of children, the thousand and one little cares which make up the work of the home, and the constant interruption and re-adjustment of her work because of visitors, because of the public work and social duties of some of the members of the home, because of sickness, etc. Surely no one wants leisure more urgently than the home-maker!

The only satisfactory way of enabling the home-maker to have sufficient leisure is to give her a proper training, and to help her to utilise labour-saving appliances. I will suggest a few directions in which labour can be saved in the model home.

1st. By a different kind of house. Architects really seem to have ingeniously contrived our houses so as to add to the work of women. As soon as we learn a little science, and begin to think seriously of the art of home-making, we realise how badly planned our houses are. People have no idea how much we suffer from our houses, and I suppose will continue to do so, until we have good women architects, in sufficient numbers, to plan good houses for us.

I will give you a few examples of the causes of our suffering:—

Think of the projecting skirting board (why should it not be flush with the wall?), sometimes also a projecting dado, usually a projecting

picture rail (why not a slip of wood flush with the wall, in which we could fix our nails?). Think of the window frames and the doors and the mantelpieces, all full of crevices for dust. All of these must be dusted once a day, and even then get dusty. Then, again, think of the question of cupboards. Architects never give us a sufficient supply, and what a labour-saving contrivance is a sufficient supply of cupboards! And what a burden the tops of cupboards are, if we have any conscience about dust. Why cannot corner cupboards be fixed in the house when it is built, and go right up to the ceiling, leaving no place for dust?

One still constantly sees kitchen dressers, full of plates, without a glass front to keep off the dust. Why are we troubled with carpets that cannot be kept clean? Why not have double floors, with rugs? There is much house-work that could be done in the open air. Why has not a kitchen always its verandah? In washing-up, what a convenience to have a double trough (to wash in one and to rinse in the other), and a conveniently placed drying-board on the left side.

Think of the way in which home-makers have to carry water upstairs when there should be a tap there. How often are water pipes on the outside wall, warranted to freeze on the slightest provocation!

It seems to me I am always trying to get the backs of my pictures dusted. How much wiser are the Japanese, who only show one or two at a time, and change them constantly, and those that are not used are packed away in dust-proof boxes in a fire-proof store house. The Japanese are also very wise in their cupboards, placed in the wall, with sliding doors, so dry, so dust-proof, and with no edges for dust.

Few things give more trouble, as well as anxiety, than sickness, therefore it is an excellent labour-saving contrivance to keep everybody in the home healthy and well. But no house can be healthy unless there is plenty of light and air. For example, each window should go up to the ceiling, partly for the light and also because we do not want a layer of badly ventilated air above the window. Architects tell me that this looks ugly, but I urge that they must invent something that does not look ugly, and yet gives us light and ventilation. I thought out such a window myself, that my architect had to confess looked quite well. A high sash window to within one and a half feet of the ceiling, and above that a glass ventilator, swinging in the middle, extending to the ceiling. One advantage was that however the wind blew and the rain poured that ventilator could always be open. A similar wooden ventilator over the door, and a well-ventilated passage and staircase, enabled me always to have cross ventilation.

Think again of the hall or passage in an ordinary small house. Above the front door is usually a window, but it never opens! This could be so

easily an important ventilating shaft. But I need bring no further examples; all thoughtful home-makers will agree with me that one of the most important labour-saving contrivances in home-making is to live in a house which is capable of being really healthy, and where the fittings and arrangements are such that the work of the home is easily done.

2nd. A second labour-saving device, of great importance, is that the home-maker should be an expert in knowledge and skill. We are the great cleaners of the world, and yet how many of us still use that absurdity, a *dry duster!* How much time and expense would be saved if we knew the best and quickest way to clean everything in the house.

Then again we are the great menders of the world, and constantly labour would be saved if we knew how to mend easily and quickly. In an interesting school, with which I had a great deal to do for several years, where we tried to teach children home-making *on new lines*, we always put double prices to everything, money and time; *e.g.*, to put a new washer on a tap, if you can do it yourself, costs 1½d. and five minutes. To clean a white straw hat costs 1d. and seven minutes.

Probably in no department of home-making is labour more wasted than in cooking, for lack of expert knowledge. If a poor working woman had a Swedish cooking box, which she could make herself, she could start her dinner on a gas-stove, place it in her box, pack it up, put out her gas, and could go out for a walk with her children in the morning! Not only is material in cooking wasted most seriously, but the labour and energy of the home-maker are largely wasted.

Again, comparatively few things are now made in the home; the home-maker has become a great buyer. How much labour would be saved if she were an expert buyer; *e.g.*, if she were an expert she would know that cheap furniture is very expensive, and that second-hand furniture wisely chosen would not only save money but save much work, especially if she could clean it, re-polish it, and re-upholster it herself.

Think, again, of the labour saved by good nursing, if the home-maker knows a few of the elementary principles of nursing. It is a labour-saving contrivance to have an expert home-maker rather than an amateur. This is indeed the chief labour-saving contrivance that I know.

Thirdly, there is, of course, the use of machinery as labour saving. Nobody ought to use machinery who does not understand something about it; does not know how to use it, and should also know when it is going wrong and is getting out of order.

A friend of mine, the other day, was starting housekeeping, and was full of ideas of labour-saving contrivances. She bought a carpet sweeper, a machine for knife cleaning, and a wringer, and in six months they were

hopelessly damaged because of the ignorance of those who used them. It is essential that those concerned in home-making should understand the elementary principles of machinery.

The most common machine in our houses, of course, is the sewing machine, and this should be used in our schools, not only for sewing but also to give the children some insight into the world of machinery. One of the most valuable inventions of late years is the vacuum cleaner, but here again you require some knowledge to use it effectively and to keep it in good order. Half a dozen houses could own one in common if home-makers and servants knew how to use it properly.

A fourth labour-saving contrivance is the use of co-operation; and here we come to a great difficulty, because the home is truly an entrenched fortress, untouched by competition, little affected by public opinion; and each home-maker, to a great extent, learns nothing from the mistakes and successes of anyone but herself. Co-operative housekeeping, though attractive in many ways, will not, I think, appeal strongly to English people, at any rate for some time to come. But there is one form of co-operation which we could utilise at once. Most other workers have their leaflet or paper giving them information of new scientific discoveries which affect their work, or failures which will save them from failure, and successes which will help them to succeed. In this, the biggest trade in the world: home-making, we still lack a satisfactory common newspaper medium of information and help.

A fifth labour-saving contrivance in the home is to be methodical, and to have a plan for organising the home-making; *e.g.*, it is of the greatest importance to utilise all the members of a household, including the husband. Nothing can be more educational for the children than to take some small share in the work of the home, if that share is wisely chosen, is suitable, and requires real work, thought and initiative, has responsibility attached to it, and is sufficiently varied. The suggestion which has sometimes been made, that school children should not be troubled with a share of home-work, is most misleading.

But one cannot be methodical and business-like if one has never learnt one's business.

Ladies, I once thought of making a collection of labour-saving contrivances and writing my paper about them, especially drawing your attention to the admirable contrivances that can sometimes be picked up in penny bazaars and sixpenny-halfpenny stalls; but I assumed that your exhibition would include many labour-saving contrivances, and we often have an opportunity of seeing such in various health exhibitions. I have, therefore, rather tried to show *the importance* of labour-saving contri-

vances in the home, and I have suggested that we should build houses on lines that will satisfy not only the city councils but also the wise practical home-makers; that home-makers should be experts and not amateurs; and that by utilising scientific knowledge, and machinery, method, co-operation, and all possible labour-saving contrivances, the home-maker should be enabled to have proper time for the higher parts of home-making, and also proper leisure in which she can keep alive and grow. She is getting much new work nowadays, and in the immediate future she will have more. It is increasingly important that in every way she shall be trained and helped to make her labour at home as time saving and as effective as possible.

Miss B. Walton Evans (Local Government Board, Whitehall) said that home-making was one of the fine arts, and that marriage did not fit a woman for managing a home any more than a woman having a child made her, without training, the most fit person to bring up that child. She did not propose to touch on those homes where a living wage was not earned by the workers, and where home-making in the true sense could not be carried out, owing to the struggle for shelter, food and clothing being all engrossing, nor with the daughters of the middle classes who lived at home, and did the table flowers, but who wanted to be trained in domestic economy; but she would ask the Congress what had been done to help the home-makers of the working classes to carry on their work successfully where environment and conditions had so much to do with aiding or retarding. The average working man's dwelling was often badly planned as regards the storage of food and the water supply. A great deal was said about the dislike of the poor to fresh air. When people were underfed and badly clothed they dreaded fresh air.

Many a mother would gladly have her girl trained for service, but had from economic pressure to send the girl to work in poor situations; whereas if we had a chain of scholarships in our elementary schools, enabling girls to have a year's training in household matters, it would be a great boon to the community, as well as to the individual.

Mr. Harbottle Reed (Exeter) said the paper on scientific home-making was full of suggestions worthy of careful attention; but, as an architect, he would have liked more information about the "different kind of house," for what that was Miss Hughes did not indicate.

She did not seem to be aware that there were architects whose first consideration was to remember the old proverb, "where the sun does not come the physician does," and so gave to each living room a full play of sunshine. He avoided all unnecessary passages, and so planned the kitchen department that the service was as direct as possible, and avoided polished brass work or whatever increased the work, and consequently the number of servants.

The projecting skirting Miss Hughes suffered from frequently prevented the chairs from damaging the wall plastering, as in bygone days the dado rail kept them off. There were places where it might be flush, but failing that a simple nosed skirting harboured little dust and was easily cleaned. Composition floors with a coved flush skirting might be used. This cove or hollow skirting was easily and effectively brushed out, and the jointless floor might be laid in any common colours, and so dispense with rugs altogether. The mantelpiece was merely a case of demand and supply. He failed to see the necessity for a kitchen mantelpiece, the cook's plea of a place for the pepper pot and polished copper kettles he weighed against the place for dust and extra work, and left it out. When the lady of the house would agree to dispense with the multitude of so-called ornaments crowded on to chimney pieces, it would be realised that the big shelf and bracket mantel had had its day. In bedrooms, for instance, the shelf might be almost dispensed with, and a moulded surround take its place.

Then as to cupboards, a plentiful supply was essential, although he often found that cupboards might be defined as snappers-up of unconsidered trifles, crowded with useless articles which should be got rid of. The provision of good store rooms as well as box and lumber rooms was very helpful.

It was not unusual to carry the cupboards right up to the ceiling, but corner cupboards were very wasteful of space. He was glad that Miss Hughes objected to the open dresser: that should be replaced by a cupboard.

Carrying water-pipes to upper floors was only a matter of expense, not merely that of the pipe, but there must be a tray and properly ventilated waste-pipe; and if the pipe was placed against an outside wall, if the wall was hollow there was little risk of freezing.

Sliding doors to cupboards gave more space for dust than the hinged door.

There was a part of scientific home-making to which more attention might be given, *i.e.*, cookery, and it might be encouraged at school in the practical manner of Lady Peek's elementary school at Rousden, where every day twelve girls were told off to provide the dinner (for which each child paid a penny). Four cook, four served the dinner, while four did the washing up. Here cooking was carried on with ordinary cottage food and cooking utensils. Their school-fellows were very good judges.

MR. J. OSBORNE SMITH (Westminster) called attention to three drawbacks to healthy homes, cupboards, curtains, and carpets. He welcomed women as architects, but did not join in their enthusiasm for cupboards, especially those enclosures under sinks, basins, and baths, which were usually receptacles for matter inimical to health. Women too often adhered to the use of heavy curtains and carpets without reflecting upon their function as dust-holders. He suggested the use of curtains which could be cleaned readily, and which were not of rough dust-holding materials, and of floors which could be polished instead of washed; the ordinary boarded floor with long lines of joints afforded lodgment for filth from shoes and dresses.

How to make the Lessons on the Care and Feeding of Infants of Practical Use to the Babies of To-day, by Miss A. Conway Henderson (Associate).

Abstract.

STATISTICS of infant mortality show the great need. In Manchester the rate for 1912 was 156 per 1,000; in Manchester township 194 per 1,000.

Incidents in actual recent experience show the prevalence of: (1) *improper feeding;* (2) *superstitious practices dangerous or injurious to health.*

A health visitor told me she was always glad when the lectures on the care and feeding of infants were given in the districts in which she was visiting, because, as one of the mothers kindly informed her, "they found there was a lot of truth in what she'd been saying about the baby after all, as the children were learning the same thing at the schools."

Many mothers, at first inclined to disapprove, have expressed gratitude for assistance in cases of wrong feeding, or ailments not quickly recognised, but yielding to simple treatment at the outset, such as rickets. The first signs of this illness are often ignored; a fat baby, however flabby, languid, backward with its teeth, disinclined to walk, is always counted healthy according to their standards, so that the discussion provoked by these lessons is often useful. Faults of management, causing inconvenience to the household, have been remedied by the same means, *e.g.*, a child gave me a message from the mother saying that baby slept so badly at night, and the whole family, father especially, spent sleepless nights in consequence. I asked the usual questions and found baby was naturally fed, and the mother strong and in good health, but baby was fed by the happy-go-lucky method of meals given every time the baby cried, instead of at regular hours. A time-table was sent home, and next week came the information that baby had slept, mother had slept, and father's snores were now undisturbed.

The lectures are made practical, for instance:

1. New baby garments, made from old stockings or other discarded things.

2. The lifting, holding the baby in the right positions practised by each girl either on baby or doll in lesson.

3. The sixth lesson is an open lesson, when mothers and babies are invited, and the babies discussed.

Lectures most convincing when actual baby is brought to be tended.

Mothers should receive slight gratuity for attending with infants, as it gives better choice of babies.

The girls are interested, and apply lessons practically to good of the infants in their own and neighbouring homes. One girl told me she had four babies to bath every day either before or after school hours.

The mother's interest and help in the lessons should be gained if possible, as though there are some mothers who almost need to be treated like refractory sheep mothers, and tied to a stake in order to prevent them evading their maternal duties, yet if you gain their help, the benefit is mutual, and the work grows healthily and happily more practical in every way.

DR. MABEL RAMSAY (Plymouth) feared that they were rather inclined to over-teaching young girls. It was rather terrible the amount of things they were expecting girls of between 13 and 14 to know.

MRS. VLIELAND (Exeter) remarked that in order to make the instruction on the care of infants given to girls in elementary schools of practical use, it must be continued after school age by compulsory continuation classes, so that the girls working in shops, factories, etc., should not forget what they learned at school.

She hoped that the use of the long tube feeding bottle would, as in other countries, be forbidden by the State; and she condemned the indiscriminate use of patent foods as *substitutes* for milk for infants.

MISS A. CONWAY HENDERSON (Manchester) said that a great many committees were willing to appoint specialised teachers to give teaching in cooking and laundry, but they seemed to think that anyone could give lessons on babies, and the result was that a doll was used, simply because no person inexperienced in baby craft *dare* give lessons from the real baby; the baby would show them up very soon if they did. If you sat a baby and a doll side by side, the folly of teaching the one from the other was very apparent, and no practical use could be made of the lessons.

The Training of Boys in Cooking after Leaving School, by C. Herman Senn.

It is generally admitted that cookery is both an art and a science, but it is essentially also a profession. It is a manipulative art which cannot be acquired by mere theoretical teaching, for it requires years of assiduous and constant practice before experience brings the desired efficiency.

The sole legitimate objects of cooking are to make food more palatable and easier to digest and assimilate. Thus the essential quality of any and all culinary preparations, whether treated simply or elaborately, is that the food cooked may be capable of furnishing nourishment to the body, and supplying new vital force to replace that which is constantly being used up by the processes inseparable from life.

Good cooking, that is "genuine cookery," is a process which preserves all the essential flavours and nutritive qualities in foods. Therefore to cook well must be regarded as one of the grandest accomplishments, for it means making the best of nature's own gifts. Bad cooking, on the other hand, is an insult to nature and an outrage against our own bodies, for it is the cause of innumerable evils. It is deplorable, that in spite of the numerous efforts made to teach the proper methods of cooking, and the many opportunities given, much of the precious food products is wasted or ruined in cooking, mainly through lack of better knowledge.

Viewing it from the practical side, the art of cookery consists of the knowledge of the various substances, food materials, and ingredients used as food, and of the best and most economical method of treating them, so as to make them nourishing, palatable, and wholesome.

This knowledge consists of four distinct parts: (1) the selection of food and food materials; (2) the preparation and treatment of food prior to cooking; (3) the application of heat for its chemical conversion, which is actual cooking; (4) the presentation of cooked food for service.

No one as yet has ever been able to fix the exact date when cooking proper was first introduced, but there can be no question that the discovery of this oldest of the arts has been one of the most useful and beneficent to humanity. For this reason alone, if for no other, the training of would-be cooks is of paramount importance, and the career itself a worthy and responsible vocation.

A cook is by no means solely concerned with the preparation and

heating of food. There are many side issues which must engage his attention if he is to reach the highest rung of the ladder of culinary success. A well-known authority upon matters pertaining to the cook's profession illustrates the virtues of a genuine *chef* as follows: "The cook is practically a chemist and compounder, and doctors the stomachs both of the well and the sick. These people should be able to partake in confidence of the food prepared for them, knowing that it is produced by men whose knowledge and experience are a guarantee that it is wholesome and good. It is the business of the cook to distinguish between pure food and that which is poisonous and deleterious. But it is only thoroughly trained, competent men as well as women who can be relied on in these matters."

THE QUALIFICATIONS OF A CHEF.

There are certain people who think that the only qualification a chef need possess is a knowledge of cookery, but these are vastly mistaken. When he has learnt to clean vegetables, and knows something about the construction and management of cooking stoves; has learnt how to truss, lard, roast, boil, steam, bake, fry, and broil or grill, and knows all about sauces, soups, pastries, sweets, ices, and fancy dishes, he is only a *cook*, not a *chef*. One of the most necessary qualifications for a *chef* is good executive ability; he must be a good judge of the wants of the public; he must learn French so that he can make out his own menus, and master the compositions of menus generally. He should also have a keen conception of the tastes of his patrons; his dishes and sauces should harmonise in colour so as to please the eye, which is the sentinel of the palate; in fact, he must be a chemist, a modeller, an artist, a designer, an epicure, and a student all in one. He must know how to keep himself neat and clean. Great is the power of example, and the staff under him should look to him for example; "like master, like man," for a tidy chef means a tidy staff and a kitchen that is a credit to anyone. Good work cannot be done in a dirty kitchen. Again, he must know something of natural history, the seasons of fish, vegetables, fruit, and game, the products of different countries, and the state of the markets. He must be an economist, allowing no waste by his subordinates: in order to do this he must calculate the amount of each article necessary to feed a certain number of guests, and be capable of utilising to the best advantage what is left over so as to avoid any possible waste. He must be able to control a staff of cooks under him and be an organiser. Then, and not till then, he is indeed a *chef*.

How Boys are trained to become Cooks.

In spite, however, of the very generally admitted importance of a culinary career, it is only practically within the last few years that any serious attempt has been made in this country to train boys as cooks with a view to their becoming chefs. We have been content with haphazard methods of instruction far too long, and it is only quite recently that we are awaking to the fact that the Englishman if properly trained is able to hold his own with his continental confrères. It is realised that cooking is a legitimate and highly-paid profession The scanty means of training cooks in this country until quite recently has compared very unfavourably with the thoroughness of the tuition of the continental chef, where the making of a man-cook is a lengthy and tedious process. He commences as a mere scullion amongst raw vegetables, and passes through various well-defined departments, such as boiling, roasting, pastry making, to the higher branches of soup and sauce making, entrées and confectionery.

Now, however, within the last four years, the London County Council, in conjunction with the promoters of the Universal Cookery and Food Association, have established in our midst their excellent Cookery Training School for boys, the fruits of which are already evident. The chief object of the school is to provide a three years' course of practical and technical instruction, under skilled chef-instructors, for boys between fourteen and sixteen years, in all branches of cookery and the making of pastry and confectionery. The building has been fully equipped with the latest culinary appliances, including a central cooking range, gas cookers, grillers, steamers, etc., also modern pastry, confectionery, and ice making departments, together with the necessary larder and storeroom accommodation. There is also a restaurant where the cooked food is served. In addition to practical cooking, instruction is given in the theory of the subject, kitchen accounts, French (for culinary terms and Menu writing), English, arithmetic, and physical exercises. The London County Council does not undertake responsibility for securing employment for boys on the completion of their three years' training, but it is understood that the Consultative Committee and the Universal Cookery and Food Association will be able to find employment for all the pupils of the school who successfully complete the course of training. Eleven lads who have just finished their training have all secured engagements, earning from 25s. to 30s. per week in some of the best hotels and restaurants in London and provincial towns.

A boy who intends to choose a culinary profession should bear in

mind what a well-known phrenologist some time ago said should be the characteristics of a good cook: "Phrenologically, the chef should possess an active mind and temperament, large perceptives, individuality, form, size, weight, colour, calculation; also eventuality and time that he may be practical, punctual, orderly, and systematic; a good judge of proportions, colours, and arrangement, and have an excellent memory . . . . he should possess manipulative talent, sense of economy, discretion, artistic tastes, firmness, dignity, confidence; a resourceful mind, imitative talent, verbal expression, and much aptability. By experience, and being a connoisseur in taste, he knows the ingredients and remembers the recipes of a vast number of wholesome and delicate dishes. He must be a good schemer, able in his artifice to make things as natural as possible, and concoct dishes at short notice. A *chef* who smokes or drinks would in time lose his delicacy of taste, and have to ask another who does not smoke or drink to do his tasting."

HOW FRANCE TRAINS COOKS.

In France, the country that provides the best cooks, a boy is early apprenticed (generally for two or three years) in a large establishment, paying a premium of from £20 to £40. He begins his career on the lowest rung, being promoted from the dish-washing to be assistant to the vegetable cook, under whom he will learn, not only how to prepare, but how to dish up vegetables. Next he spends three months in the larder, learning, among other things, how to cut raw meat, to prepare fish and birds, etc., and, incidentally, how to choose the best. Six months are passed with the confectioner, who also has charge of jelly and ice-making. Then he will have to learn how to roast, boil, steam, fry, stew, and braise; to learn the making of soups and sauces, and will have another six months for preparing entrées and savouries. When all this is gone through, the "chef de cuisine" takes him in hand and gives him lessons in the niceties of his art. When once his probation is over the young man endeavours to travel, picking up further practice in various cities while filling, in many instances, subordinate posts, so that he can gain additional experience and knowledge. This is the training the average British lad who wishes to become a cook should be able to get if he is ambitious enough to be equal in skill to his foreign confrères.

There never was a time when talent and skill in cooking was more valued and appreciated among educated persons than the present. This is not because the world thinks more of good living than formerly, but

because the art of catering is better understood, and therefore good cooking is appreciated as it deserves to be.

We must, however, regard cooking as a distinct and honourable profession, not a mere menial occupation as is frequently the case, and encourage youths with good education and good physique to take advantage of the training offered them by technical schools or by reputed catering firms, of which there are many willing to take an apprentice, where the cooking trade in all its aspects can be properly learnt and studied. If this is done thoroughly and systematically, there is no reason why we should not be able to produce as many good cooks in this country as our Gallic neighbours, not because there is any desire, as has been erroneously stated, to oust the foreign chefs from this country, but to afford English lads the opportunity to possess the necessary knowledge and experience to enable them to work side by side with their foreign confrères.

SECTION D.—HYGIENE OF INFANCY AND CHILD STUDY.

Presidential Address, by E. J. DOMVILLE, L.R.C.P., M.R.C.S., J.P., Consulting Surgeon to the Royal Devon and Exeter Hospital, President of the Section.

PERIODICAL meetings, such as those arranged by The Royal Sanitary Institute, afford an opportunity for reviewing the situation and noting the progress, if any, that has taken place in carrying into practical effect the theories for the improvement of social conditions that are generally accepted as being logical and necessary.

Unfortunately, it is not sufficient for the truth of arguments, nor for the desirability of drastic alterations in the conditions under which many of our people exist to be *recognised;* but it is necessary to keep the need for improvements in the foreground, and to repeat over and over again arguments and facts that have lost their freshness, but which are still unheeded by the bulk of the nation, and for serious consideration of which our statesmen and legislators cannot spare the time.

So it is, that every year we have to record a frightful waste of child life, and although it is true that the Registrar-General is able this year to present a more favourable report with reference to the national death-rate, and also in the diminution of infant mortality, still we have lost from preventable diseases far too many of those who might have grown up to be useful citizens. When the late King Edward addressed the members of a great International Congress in London, and speaking of typhoid fever, said, "If preventable, why not prevented?" he gave expression to a thought which must be in the minds of many of those who analyse the records of the registered causes of deaths in childhood.

Medical officers of health and others who have made a life-long study of the question have constantly called attention to the terrible yearly loss to the nation by the deaths of so large a proportion of children in early life, and for every infant that dies we may also reckon that at least two others are handicapped at their start in life by disabilities consequent on neglect or preventable disease.

The death-rate for England and Wales for the past year, 1912, 13·3 per 1,000 of the population, was 1·3 per 1,000 below that in 1911, and was the lowest yet recorded; it was 1·9 per 1,000 below the average for the preceding ten years.

The late Earl Fortescue, in his Presidential Address to this Congress in Exeter thirty-three years ago, when considering a death-rate in large cities of 24 per 1,000, suggested 17 per 1,000 as an ideal at which we might aim. It is evident that some effect is gradually being produced by sanitary reform and by the education of the public in these matters, but as regards the nursing and general care of children there is still much left to be done.

It is indeed fortunate that we are able to congratulate ourselves on an improvement on the rates of infantile mortality in 1911, for in that year 114,798 infants died before they were one year old, or in other words 13 out of every 100 that were born in England and Wales, and in some towns the rate was more than 20 in every 100.

We have also to remember that in 1911 38,467 deaths of children under two years of age were attributed to diarrhœa, enteritis, etc. and 12,979 to measles.

If we examine the figures which record the deaths of infants under one year, and also those from enteritis and diarrhœa in children under two years, we have probably to consider improper feeding as a contributing cause; and if we also look at those from some of the infectious diseases especially associated in our minds with childhood, such as measles, whooping cough, and scarlet fever, we are dealing with a large group in which increased care and watchfulness would probably produce very beneficial results.

In England and Wales in 1912: Of 486,967 deaths, 82,939 were those of infants under 1 year=95 per 1,000 births (*35 per 1,000 less* than in 1911, and *30 below the average for 10 years.*

In the 95 large towns: Of 242,689 deaths, 44,086 were those of *infants under 1 year*=101 per 1,000 births.

In 146 smaller towns and cities: Of 57,855 deaths, 10,895 were those of *infants under 1 year*=98 per 1,000 births.

Thus we see the figures stand :—

For the whole of England and Wales, of	1,000	born	95	died
In the great towns	„	„	101	„
In the smaller towns	„	„	98	„
In the towns, etc., outside	„	„	86	„

Again, if we take the case of deaths under two years from diarrhœa and enteritis :—

In England and Wales ...	7,445	deaths,	8·53	per 1,000	births.
In 95 great towns	4,758	„	10·91	„	„
In 146 smaller towns	888	„	8·01	„	„
The rest of England and Wales	1,799	„	5·52	„	„

	Measles.	Whooping cough.
In England and Wales ...	12,696	8,250
In 95 great towns	8,193	4,594
In 146 smaller towns	1,649	1,136
The rest of England and Wales	2,854	2,520

Deaths per 1,000 living.

	Population.	Measles.	Whooping cough.
In England and Wales ...	36,539,636	0·35	·23
In 95 great towns	17,639,881	0·47	·26
In 146 smaller towns	4,641,174	0·35	·24
The rest of England and Wales	14,258,531	0·20	·17

If it is thus clearly shown that there is this great waste of child life, and that it is in all respects greater in large, and especially in manufacturing, towns than in smaller towns where factories are scarce, and in both of these there is an excess over the country districts, surely it should be possible to discover the chief elements of difference in social habits and conditions which in some way account for this, and when we have discovered them to apply the appropriate remedy.

In his summary for 1911, the Registrar-General said:—

> "The inhabitants of many of the towns with high rates of infantile mortality are chiefly engaged in the mining, textile, or pottery industries, and their high rates would seem to indicate that these occupations are frequently associated with conditions prejudicial to infant life."

But further, as an indication that improvements are possible, he says:—

> "In 1911, of the thirteen great towns with low rates of infantile mortality, ten appeared in a similar list in 1909. Many of these towns may be described as residential suburbs (Hornsey, Croydon), but there are some others in which industrial pursuits are carried on; it is evident, therefore, that industrial urban life is not incompatible with a low rate of infantile mortality."
>
> "It will be noted that in several of these towns the birth-rates are exceptionally low; on the other hand in Coventry with 27, and Leyton with 24·5 the birth-rates in 1911 were above the rate for the whole country, *i.e.*, 24·4."

All endeavours to remedy the evil have to encounter the opposition or rivalry of ignorance, tradition, extreme poverty, plausible advertising, apathy, drunkenness, and immorality. All these are well-known facts that have again and again been brought forward at meetings and conferences of this and other associations for the betterment of the national health, but

"Knowledge comes and Wisdom lingers";

and in face of the very slight evidence of a determination to deal more

practically with the cause of this grave national failing, it is still necessary to reiterate them over and over again, and in season and out of season to press them on the attention of an apathetic public.

The elementary character of the truths to be taught, and the mere simplicity of the rule of compliance with Nature's laws, are in themselves stumbling blocks to the truths being generally accepted.

If it were necessary to recommend the adoption of some complicated system of diet, some medical preparation that could only be procured with difficulty, or some intricate system of physical gymnastics as remedies, it is possible that a better hearing would be given to the scientific teacher of wholesome but unpalatable truths—

"Science moves, but slowly slowly, creeping on from point to point."

Everyone will readily admit that the infant is imperfectly developed, and that the bones and muscles are not yet ready to bear the weight of the body; and yet it is assumed that the internal organisation is complete, and that all the organs are completely equipped for the full work of life, in spite of the evident fact that the teeth are absent, which might suggest that the digestive apparatus is incomplete.

Nevertheless, we find that it is for ever necessary to press on the attention of nursing mothers that the nourishment provided by the wisdom of Providence in their breast milk is far superior to any alternative that can be devised, and that most of the ailments of the infant are to be traced to the use of some substitute that cannot be assimilated, and whose presence in the digestive canal causes that irritation and distress of which the inevitable consequences are seen in peevishness and restlessness, convulsions, diarrhœa, enteritis, wasting, and premature death.

That the want of breast milk may be adjudged a cause of many of these troubles may be gathered from the comparative figures given before.

In manufacturing towns where the mothers are engaged in factories or other centres of work, which keeps them from giving that personal attention to their babies that is needed, we have seen that the incidence of avoidable disease and a higher death-rate is to be noted. In spite of the provision of the Factory Act of 1901, by which it is provided that no woman or girl may be "knowingly" employed in a factory within four weeks after childbirth, it is said that the lady inspectors constantly complain that this clause of the Act is ignored. A factory owner can always plead ignorance of the date of the birth of the child, and it is suggested that a medical certificate should be required before a woman can resume work after her baby is born.

In a paper read before the Congress at Belfast in 1911 Miss Hilda Martindale alludes to this difficulty* :—

> "The law does not allow a woman to return to work in a factory within one month of childbirth. It is a difficult provision to enforce, and I am afraid is frequently evaded.
>
> "One firm has realised this, and has established a scheme by which every woman who has been in their employment for twelve months is entitled to an allowance of twelve shillings per week for eight weeks before the birth of a child and for four weeks after. If the doctor then certifies that the mother is nursing the child, the allowance holds good for a period of a further nine weeks, otherwise it ceases. The scheme is non-contributory, the whole money being given by the firm. It is difficult to imagine a more really charitable action."

Miss Martindale gives the following figures:—1,288,544 women over 18; 430,070 girls between the ages of 13 and 18; a total of 1,718,514 women and girls (excluding girl children) daily engaged in factories and workshops.

A recent return from textile factories which, although not exhaustive, is fairly representative, shows that 72 °/₀ of the women were unmarried, 24 °/₀ married, and 4 °/₀ widowed.

When introducing the Insurance Act on the 4th May, 1911, Mr. Lloyd George said:—

> "There are only one or two friendly societies at the present moment which allow any maternity benefit, but they are all alive to the necessity for it, and they are gradually going on to establish branches for maternity benefit. Undoubtedly there is no more urgent need.
>
> "Women of the working classes in critical cases are neglected sadly, sometimes through carelessness, but oftener through poverty, and that is an injury not only to the woman herself but to the children that are born. A good deal of infant mortality, and a good deal of anæmic and rickety disease among the poorer classes of children, is very often due to the neglect in motherhood.
>
> "We propose to take the maternity benefit of the Hearts of Oak Society, which, I think, has established a most successful benefit scheme in this respect. We propose that there should be a 30s. benefit in those cases, which would cover the doctoring and nursing, but only conditional upon those who are women workers not returning to work for four weeks; for I am told that in the mills you have very often cases where women work up to the last moment, and the maternity is over in a comparatively few days. I believe we ought to make some provision in the interests of humanity to prevent that from taking place."

To secure for the nursing mother the extra advantages that this maternity benefit should secure, both for the mother and her infant,

* *Journ. R. San. I.*, Vol. XXXII., p. 634.

some further regulations are apparently required if the benefits foreshadowed are to be realised.

Before the passing of the National Insurance Act large numbers of the so-called working classes were in the habit of putting by, week by week, the amount necessary to provide for the payment of the fees agreed to be paid to the doctor and nurse in the case of a confinement, and this weekly saving was not felt as any great hardship, both husband and wife being naturally aware of the need and willing to make proper provision. At the same time this custom was an encouragement to thrift generally.

Now, the certainty of the sum being forthcoming tends to lessen the feeling of personal responsibility, and instead of being, as was doubtless intended, a source from which extra and perhaps more appetising nourishment might be provided for the nursing mother, the maternity grant is largely absorbed in the payment of fees, and any balance is available for the payment of old debt or the entertainment of friends in celebration of the event.

Little by little and by very slow degrees the nations of the world are recognising the fact that the most important object to which the thought of legislators and statesmen should be directed is the health and physical well-being of the community. Behind the consideration of all political questions lies the fact that to carry any policy into effect it is essential that sane, able-bodied individuals must be available.

The raising of money for the building, equipment, and maintenance of asylums, refuges, prisons, hospitals, work-houses, and the like would cease to be one of the principal duties of the community if the race were born of healthy parentage, if motherhood were restored to its proper position in public and private estimation, if families were housed with due consideration for moral and physical needs, and if children were trained to live healthy and useful lives.

This Section of the Congress is a testimony to the matured opinion of the Council of The Royal Sanitary Institute that to secure a healthy life for the individual it is advisable to study the conditions of his environment and training from early infancy. The combined title of this Section recognises and takes note of the useful work that has been done and is being carried on by the Child Study Society in its various constituent branches.

The object of the Child Study Society is the scientific study of the mental and physical condition of children, and also of educational methods, with a view to gaining greater insight into child nature and securing more sympathetic and scientific methods of training the young. The members

are thus helping to classify children of school age as to the extent and character of training, both physical and mental, from which they are capable of receiving benefit.

The general public from whom school managers and education committees are selected, often without any special aptitude for the work, requires to be reminded that all children are not equally equipped either mentally or physically; the medical inspection of elementary school children has been of great service in bringing to light many physical disadvantages and defects due to their parentage and environment, which seriously hindered children in their preparation for the battle of life.

In spite of the sneers that sometimes greet the recital of the efforts of students of the modern science of Eugenics, it is to be hoped that the force of public opinion will be used increasingly to discourage the mating together of hopelessly defective or diseased human beings, so that the question may one day receive something approaching the importance that even now attaches to the rearing of cattle and poultry.

It is much to be regretted that the members of the House of Commons have difficulty in finding time to adequately discuss and settle the various questions affecting the public health that are brought before them; but it will be a calamity if Bills like the "Milk and Dairies Bill," both for England and Scotland, which are designed to safeguard the milk supply, fail to pass, or if the Bill for the Care of the Mentally Deficient should be shelved.

It ought not to be necessary to use any compulsion or, indeed, pressure to induce parents to do their duty to their children; but experience unfortunately teaches us that there is still much to be done before that ideal condition of affairs is reached, and by every means in our power we must enforce attention to natural laws and point out the inevitable consequence of disregard of them.

By education, encouragement, friendly visits, and, if necessary, by further legislative action, we must secure for every little citizen born in this great empire a fair start in life free from the fetters of preventable inherited disease, must make secure amongst us the recognition of "motherhood," with its duties, responsibilities, and pleasures as the ideal life's work for those who are privileged to attain it, and must keep as the centre of our national life, for rich and poor alike, the Englishman's home.

Dental Hygiene in Infancy and Childhood, by J. Sim Wallace, D.Sc., M.D., L.D.S.

IN opening this debate on Dental Hygiene in Infancy and Childhood, I will refer in the first place to the general principles of oral hygiene, and after having done so will devote attention to the practical application of these principles with regard to dental hygiene in infancy and childhood.

To understand properly the physiology of oral hygiene it is necessary to refer to the physiology of mastication, for although the chief function of mastication is the preliminary preparation of food in order to facilitate its digestion, it has a secondary function, in that when suitable foods are masticated it cleans the teeth and facilitates the action of the saliva in doing likewise. It should be noted, however, that many foodstuffs which are consumed at the present day are hardly subjected to the process of mastication at all. The food is simply taken into the mouth, receives a general squash between the teeth or between the dorsum of the tongue and the hard palate, and is then swallowed. This method of mastication, if mastication it can be called, is, as a rule, adopted for custards, fine meal porridge, soft puddings, and soft, non-fibrous foods generally.

When there is a certain amount of coarse or fibrous matter in the foodstuff, then the process is essentially different, and mastication is performed in a more thorough manner. In this latter case the food is crushed and torn between and heaped on to the masticating surfaces of the teeth by the muscular contractions of the tongue, cheeks and lips, and by motions of the lower jaw. During comminution between the teeth, the juices of the foodstuffs, the saliva which becomes incorporated, and the suspended non-fibrous part, are pressed out from the fibres and gradually collect during the process on the middle of the dorsum of the tongue, which is gradually hollowed out for the reception of such food, and this part is then swallowed. The fibrous part of the food, however, is subjected again and again to the crushing and disintegration between the teeth.

When for any reason mastication is not performed on one side of the mouth, the teeth on that side become coated with mucus, tartar, and food *débris*. It is evident, therefore, that mastication of fibrous food is conducive to dental hygiene. Now let us turn our attention to mucus and saliva. Mucus is important as a lubricant, and, mixed with saliva, a vehicle for the removal of food particles. It lubricates the mucous

membrane and teeth on the one hand, and the food on the other, thus facilitating the passage of the food from one part of the mouth to another during mastication. Being of a sticky and tenacious character particles or shreds of food are, as it were, caught or roped and pulled backwards down the throat with each act of deglutition. Thus, therefore, food of a particulate or shreddy nature is relatively easily removed from the mouth. When the food is not of a short, pasty, or viscid character, the mucus, generally speaking, ensures its complete, or practically complete, removal from the buccal cavity. The mucus is, in general, secreted in amounts proportionate to the requirements of the particular kinds of foods for this purpose. Likewise the saliva facilitates the same physiological processes, and the quality and quantity secreted is also, generally speaking, proportionate to the requirements of the food consumed. Saliva has also a marked effect in preventing acids taken in food, or developed by bacteria, from decalcifying the enamel, and this effect seems to be much greater than could be accounted for simply by its power of neutralising the acid. Mucus is freely miscible with saliva, so that even if mucus has no similar power in protecting the enamel from decalcification, it does not hinder such beneficent action of the saliva. The variations in the amount and quality of the saliva and mucus, corresponding to the quality of the food consumed, appear to be common to all, whether "susceptible" or "immune" to caries. That this is so is not a subject of controversy, but, nevertheless, the fact that the normal physiological processes supply with marvellous ingenuity the means of securing the cleanliness of the mouth and teeth seems to be most persistently overlooked by many who believe that the mouth is clean, or otherwise, according to whether it has or has not been brushed with a toothbrush.

At one time it was taught that the function of the saliva was to digest starch. To a slight extent this is no doubt true; but by far the most important function of the saliva is to keep the mouth in a hygienic state. Substances which might be noxious to the teeth, if they remained for a considerable time in the mouth, are as a rule rapidly got rid of by the saliva, and in general we may say that the saliva is secreted in quantity and quality proportionate to the necessity for the removal or control of substances obnoxious to the teeth. Thus, accordingly, sugar in the mouth causes a copious flow of saliva, yet sugar is not digested by the saliva, and the rationale of the copious flow is to get the sugar out of the mouth and prevent it from doing harm. Similarly acids call forth a copious flow of saliva. If acids were retained in the mouth without dilution or neutralisation by the saliva, injury might be done to the teeth. But special

provision is made for the prevention of such injury, for not only does the acid call forth a copious flow of saliva, but it also tends to precipitate the mucus on the unrubbed surfaces of the teeth, which hinders the acid from doing harm to the enamel. Over and above this an afterflow of alkaline saliva is induced, which helps to clear the mucus which has been disorganised by the precipitation of the acid, together with food particles and bacteria, away from the teeth. Then again, dry foods stimulate the flow of saliva, for their removal is facilitated in this way. On the other hand, liquids of a neutral or alkaline character do not stimulate the salivary secretions. They are easily swallowed, that is to say, passed out of the mouth without the aid of saliva. If the foods were of what we may call a natural kind, the mouth and teeth would always be clean, and the teeth would remain free from caries, as the teeth of animals do; but on account of cookery and the artificial refinement of food, the natural self-cleansing processes of the mouth are frequently stultified. Thus, for example, sugar may be so concentrated as to hinder the action of the saliva; the fibrous part of the food may be so thoroughly eliminated as to make mastication impossible; while farinaceous food may be so viscous and refined, that after it is plastered into the crevices of the teeth the saliva may be unable to remove it before injury is done to the teeth. Most vegetable foods, especially fruits, very generally associate cellulose, sugars, acids, aromatic, and even acrid principles, and it is scarcely right to consider the effects of any one of them when dissociated from the others. They naturally supplement each other in oral hygiene. Thus, while the cellulose, on account of its physical nature, is arrested in the mouth, and disintegrated by the teeth, the acid and aromatic principles stimulate the flow of saliva and help to loosen the cellulose framework. Further, the aromatic taste often remains in the mouth and continues to stimulate the flow of saliva even after the food has been swallowed. It was for foodstuffs as they were presented in nature to man and his ancestry that his organisation was most perfectly adapted, and it does not necessarily follow that a concentrated extract of any such food is necessarily harmless to the teeth, or even the mucous membrane of the mouth.

As far, then, as the teeth are concerned, a physiologically correct meal requires, firstly, that it should contain a reasonable amount of food of a firm or fibrillar nature which will necessitate efficient mastication, and thereby remove all bacterial plaques or masses from the masticating surfaces of the teeth; for if bacterial plaques or masses are allowed to remain on the masticating surfaces of the teeth, viscous or finely ground carbohydrate food would tend to lodge in the crevices of the masticating

surfaces and so induce dental caries. Secondly, a physiologically correct meal should terminate with some foodstuff which is of a detergent nature or, at least, not liable to lodge in the crevices of or between the teeth. For this purpose we are limited to savouries, to pulled bread with cheese and celery, followed by water or some more refreshing drink, preferably slightly acid and aromatic, or to fresh fruit.

Notwithstanding these alternative terminations, it will be found in practice with numbers of children that the best and most suitable termination, and the termination which children most relish, is fresh fruit. Nothing is more conducive to the hygiene of the mouth except, perhaps, raw vegetable foods, so that fresh fruit should practically always form part of the routine dietary of healthy children, and after fresh fruit has terminated the last meal of the day (which should not be taken just before going to bed) nothing should be allowed except water.

In considering what is necessary for the prevention of dental diseases in infancy or childhood, several other considerations besides oral hygiene require to be taken into account, such as, for example, that the development of the jaw should be sufficiently effectually stimulated to insure the possibility of a regular arrangement of the teeth. Inasmuch, however, as the rules requisite for the maintenance of oral hygiene do not essentially differ from rules which might be made for the stimulation of the healthy development of the jaws and alveolar processes, further reference to these subsidiary questions need not be made. All that is necessary now is to lay down a few simple but important rules which will clearly indicate the practical application of the physiological principles noted in the earlier part of this paper.

1. During the first two-and-a-half years of life all starchy or sugary food (except milk) should be given in a firm or fibrous form, so as to stimulate mastication and insalivation, and thus to promote the healthy growth of the jaws and the regular arrangement of the teeth. Bread, rusks, or any other farinaceous food should never be added to or soaked in milk. Bread with crust (and butter), toasted bread (and butter), should form a considerable part of the solid part of the meals habitually given to children of this age. As the infant passes from the milk diet to the more solid diet the milk should be more and more diluted with water. During this period also the solid food should be eaten first and the milk and water taken after.

2. After the age of two-and-a-half years children should always have a considerable amount of the farinaceous food in a form which will stimulate a pleasurable amount of efficient mastication. The albuminous

part of their diet should also be presented in a form which will encourage mastication, *e.g.*, boiled fish, meat, and later, bacon. Milk or milk substitutes should only be allowed in small amounts.

3. The meals should be arranged in such a way that if soft, starchy, or sugary food has been eaten, the mouth and teeth will be cleansed by food of a detergent nature taken immediately after. Thus, therefore, when sweets of any kind, *e.g.*, milk puddings, jam rolls, cake, sweet biscuits, bread and marmalade or jam are eaten, fresh fruit should be eaten afterwards.

4. Three meals daily are to be preferred to any greater number, as the longer the interval the more hygienic is the state of the mouth and stomach, and therefore the more perfectly adapted for the reception of a further meal. Sweets, chocolate, or biscuit and milk should never be eaten between meals or before going to bed.

When these rules for the prevention of decay in teeth cannot be observed, some attempt should be made with a small toothbrush to clean the crevices of and between the teeth after every unhygienic meal, but as this is extremely difficult to do effectually without injuring the teeth or gums, it is advisable to have children, who are brought up in this way, taken regularly to the dentist from the age of three onwards every six months, till the teeth become crowded and irregular; thereafter the visits may require at times to be more frequent until all the natural teeth have been replaced by artificial substitutes.

Foodstuffs and Dental Caries.

The following foods are not cleansing and liable to induce dental caries:—

Farinaceous and sugary food in general without fibrous element.

Examples: Sweet biscuits and cake, bread and marmalade, bread and jam, new bread without crust, bread soaked in milk, milk puddings, porridge and milk, preserved fruit, chocolate and sweets of all kinds, honey.

Liquids: Cocoa and chocolate.

These foods should not be eaten except when followed by foods of the cleansing kind.

The following foods are cleansing and preventive of dental caries:—

Fibrous foods generally.

Examples: Fish, meat, bacon, poultry, uncooked vegetables, lettuce, cress, radish, celery. Cooked vegetables are as a rule cleansing, but in a less degree than uncooked vegetables.

Stale bread with crust, toasted bread of all kinds, twice baked bread, pulled bread and cheese.

Savouries. Fresh fruits, especially those requiring mastication, *e.g.*, apples, fatty foods, *e.g.*, butter and margarine.

Liquids: Tea, coffee, water, also soups and beef tea.

DR. JAMES WHEATLEY (Salop County Council) said that presumably the work of public health authorities was to safeguard the public health and improve the physical condition of the people. This broad statement, which everyone must admit, appeared to have been to a great extent lost sight of in this connection. He ventured to say that there was no physical defect or disease that was producing so much ill-health and physical unfitness as dental caries and oral sepsis, and at the same time that its cause was well understood and its prevention a comparatively simple, although laborious matter. Under these circumstances one would have expected that every medical officer of health in the country would have been exerting himself to get rid of these conditions. He had searched the reports of medical officers of health without finding any reference to this matter, and so far as he could ascertain no action whatever was being taken by them. In the county of Salop out of 4,000 children examined in the year 1912, at the age of 5–6, no less than 1,100 had ten or more decayed teeth. The condition was a disgrace, and if energetic action was not taken, public health authorities would deserve the censure of future generations. He advocated education of mothers by health visitors, of school teachers, and through them of school children, of nurses and midwives, and last, but not least, of the medical profession.

MISS B. WALTON EVANS (London) referred to the importance of children's teeth being attended to. The results of twelve years' work in regard to Poor Law children justified care being given; when teeth were stopped, particularly the first molar teeth, the result in regard to health was marked. There was a lot of ignorance yet to be dissipated, as it was looked upon too often as a "fad" to require teeth to be seen to; she appealed to all Poor Law Guardians and other public authorities to help the movement. The use of the toothbrush was a vexed question, and when the family used it as well as the child it was very undesirable.

MISS A. CONWAY HENDERSON (Manchester) said two questions arose from work in slums. Were not dummy teats very injurious to teeth, and the practice of chewing gum, pieces of which were often handed from mouth to mouth, likely to lead to dental caries? If so, why were these things allowed to be sold so generally in chemists' shops?

MRS. ELIZABETH MORRIS (London), dealing with the statement that nothing was being done by the medical officers, so far as treating the children's teeth, said the Camberwell (London) Board of Guardians arranged for the examination

of the mouths of children under their care, and when necessary sent the children to a dentist. It seemed unfair that it should go forth that children were neglected to the extent mentioned. As Guardians they were responsible for the children's welfare, and did not shirk their responsibility in this respect.

Dr. S. G. Mostyn (Darlington) remarked that he had been anxious to learn what advice to give about the teeth of school children, but had failed to find in books information of the kind needed by a school medical officer. Administrative officials wished to learn from experts, as they did not wish to give bad advice and could not afford to make mistakes, but he would ask experts to learn more of the conditions in which administrative and executive officials did their work. Instead of giving advice suited to an ideal state they had to do the best they could with things as they were. The work in the schools had already led to increased interest being taken by parents in their children's teeth.

Dr. G. A. Auden (Birmingham) said that as the Birmingham Education Committee had begun the largest scheme for school dental clinics in the country, it might be of some interest if he gave a short description thereof. The scheme (not yet in full work) was the result of a preliminary investigation, due to the generosity of an anonymous donor, which showed that 96 per cent. of the children in the elementary schools were in need of dental treatment. It consisted of five whole-time dentists, and two part-time dentists, and confined its attentions to the six to eight years old group in order to save the first permanent molars. The work was carried out at one central clinic and four school clinics in different parts of the city. There was also a peripatetic chair for the most distant schools. But at present *education* was necessary, and the Board of Education now required much more stringent examinations of teachers, so that example might be better than precept. But education was also needed for the children and the parents, and as these were not prepared to pay for preventive treatment, any preventive treatment must, for the present, be offered gratuitously or nearly so if success was to be obtained.

Dr. Lauzun Brown (Finsbury) said that the Holborn Union, where he was a Guardian, showed the greatest interest in the welfare of the children's teeth by employing qualified dentists, and supplying toothbrushes to the children. The teeth of the other inmates were properly attended to. It was, therefore, wrong to say that nothing was being done for the hygiene and care of the children's teeth. As regards the diet, the best teeth in the world were among the Fantis and Ashantis, who lived on soft foo-foo and bananas. It was absurd to suggest that all food should be hard.

Dr. Barlow (Wallasey) thought the debate had gone on a line different from that which the reader of the paper intended, which was not so much the care of the teeth by conservative dentistry, but by so educating the people as to render the dentist unnecessary, or nearly so. The measures advocated were very

simple, so simple indeed as to render an extensive trial imperative; they practically consisted of one thing, the use, generally speaking, of harder food, finishing up with an apple. Was it not better to prevent consumption than to have to cure it? It was likewise better and cheaper to prevent dental caries than to employ an army of dentists to imperfectly repair the injuries to teeth which should never have appeared.

DR. J. W. MILLER (Hereford) referred to the importance of the diet in the prevention of the decay of the teeth. In Hereford a dental school clinic had been established, the teeth of children aged six, seven, and eight were being inspected and treatment carried out. On one side of the cards inviting children to be present at the inspection, instruction was given on the prevention of decay of the teeth, such as cleansing the teeth and the importance of the chewing of food of a cleaning nature; the school clinic might thus be a centre for the education of parents in the prevention of decay of the teeth. Addresses were given on the diet in relation to the teeth, etc. At the same time, although every care was taken in regard to the suitability of the diet in reference to the teeth and the use of the toothbrush, there always remained treatment to be carried out by the school dentist, and that played an important part in any scheme for the care of the teeth; the filling of a carious six-year molar would often prevent further decay in the adjacent teeth.

DR. EDMUND M. SMITH (York) was sure that many medical officers of health (whether school medical officers also or not) had been much concerned for some years past about the prevention, as well as the treatment, of dental caries.

At York for some years past they had issued many hundreds of leaflets about the care of the teeth, and they had also made a very prominent feature of teaching on this subject at their Tuberculosis Exhibition and their Health Exhibition; it should be an important item in the teaching emphasised in connection with the National Health Week.

He thought a great deal was being done in this way by printed, graphic, and personal instruction, and the paper should stimulate them to do more. Many public health officers were much indebted to Dr. Sim Wallace for his lucid writings on the theme.

Much as he agreed with the author as to the supreme necessity for teaching in the direction of the prevention of dental caries, he was strongly of opinion that the dental clinics were also an absolute necessity in order to alleviate the damage already done in so many mouths, and in order to improve conditions of the mouth which were leading to much chronic or acute ill-health amongst children. It was impossible to allow damaged teeth to go untreated. Furthermore, the dental clinic, if properly used, may become the most active medium of education as to the prevention of dental caries and the care of the teeth, the teachers co-operating in their hygiene lessons in the schools.

Is Provision needed for the Care of Children under the School Age?

by P. H. Stirk, M.R.C.S., D.P.H., School Medical Officer, Exeter.

THE object of this paper is to point out some respects in which our present administrative machinery for the preservation of child life and physical improvement of our children appears to be incomplete, and it will have attained its object if it induces a discussion as to the means that should be adopted to consolidate and extend the various agencies we at present possess, and as to the desirability or otherwise of the establishment of additional institutions or measures for the purpose.

At birth, by the Notification of Births Act (where adopted), a child is brought to the cognisance of the health visitor (if there be such an official appointed), and possibly through that official, or otherwise, it may be brought under the influence of a baby's welcome club, school for mothers, or similar institution (where such exist). These institutions are doing excellent work as far as they go; they are largely voluntary, but some are assisted by money grants from local authorities. They are at present only dealing with a small proportion of the child life of the country, and mostly cease their activities when the child has attained the age of one year, though some few follow up their children to the age of three. We have thus a partial provision for the supervision of our poorer children during their first year, and a less one up to the age of three; but the question then arises: Is any further provision necessary or desirable for children from the age of one to that of five when compulsory school attendance commences? Most people will agree that, given good home conditions, the best place for a child of this age is at home under its mother's influence; but we have to deal with things as we find them, and, unfortunately, those of us who are in touch with children of this age know that the homes of many are not suitable environments for the rearing of healthy children, sometimes owing to the homes themselves, sometimes from the ignorance or habits of the parents.

It frequently happens that owing to both parents having to work, they themselves, where no other provision exists, have to make some arrangements for the supervision of their children, and these arrangements are often of a most unsatisfactory nature. Undoubtedly, children from unsatisfactory homes and whose parents go to work are better cared for in an institution, if only for a few hours daily.

The Board of Education do not recognise the admission of children under three years of age to the elementary schools, or, at any rate,

do not contribute a grant for such children. I have heard the suggestion made that they should be allowed to attend, but should not be entered on the school register, provided there is room in the school and the parents desire it, and my own experience is that not infrequently parents will state that a child under three is three, in order to gain such admission. The Board of Education have also given permission by the codes to local authorities to refuse admission to children under the age of five years to any school provided by them if they so determine. The common practice seems to be to admit children under five years of age provided there is accommodation.

It is estimated that one-tenth of all the children attending our elementary schools are under five, and we have it upon the authority of the women inspectors of the board in the special report issued in 1905, after a careful investigation of the point, that such children get no *intellectual* advantage from school instruction.

Although they may not gain *intellectually*, there are ways in which they may gain when the infant departments are conducted upon the best lines, and one of these is in physical development. If there is no other gain by school attendance at three, there is this: the children are brought under the notice of the school medical officer. A study of the report of any such officer shows how necessary systematic medical inspection has been found to be at this age, and any teacher will confirm the opinion that the neglected children are much better kept and looked after during school attendance than in the holidays. But my point is that we recognise the need for help and supervision for some children under one year of age as shown by the extensive establishment of infant consultations, babies welcome clubs, municipal milk depots, etc., that has recently taken place. We also recognise the necessity of these same children being under medical supervision when in school attendance, which may be at the age of three or may be postponed until five at the will of the parent or that of the local education authority, and there is no doubt that in the case of neglectful parents, attendance at school of young children is purposely postponed until the compulsory age of five is reached; but, apparently, it is considered that between the ages of one and three, or possibly five, these same improperly-managed children may be safely left to the care of their parents, to be found (those of them who have meanwhile escaped death by measles or other infectious disease) later, when admitted to school and medically examined, to have developed an extensive amount of preventable defects, such as squints, enlarged tonsils, discharging ears, etc., for which it is the duty of the school medical officer to advise, persuade, or insist

upon parents obtaining remedy as far as possible, because in many instances, by this time, permanent disablements, such as partial deafness and defects of vision are established, which no amount of treatment can restore, whereas, if early attention had been given, the child might have been saved from a defect of a permanent character, which will handicap him or her for life.

From the age of one to that of five a child is passing through a critical stage of development; the death-rate at these ages is high, the mortality from certain infectious disease is great. To give one instance, over 90 per cent. of the deaths from measles occur under five years of age, and this disease is most fatal under the age of three. Under present circumstances children from one to three are unprovided with any of the advantages open to older children. Has not the time arrived when the Notification of Births Act, the appointment of health visitors, and the establishment of municipal infant consultations should be made compulsory in urban districts, and some provision made for attending to the physical welfare of our younger infants upon the lines already applicable to the older infants?

Granting that some provision is necessary for the welfare of those of our children between the ages of one and five whose home surroundings are undesirable, what form should this take? Should it be an extension of our present infant school, the establishment of the crèche, école, maternelle, or nursery school?

Ordinary infant schools, at any rate, such as I am acquainted with, would be unsuitable for children under three, and the question arises, whether they are the best provision for our present so-called babies' class. Doubtless they have been greatly improved during recent years, but still they leave much to be desired. It is no fault of infant head-mistresses that this is so, and they do admirable work with the staff and equipment with which they are provided. We find in the code issued by the Board of Education the following instruction: "That the principal aim of the school in relation to infants should be to provide opportunities for the free development of their bodies and minds, and for the formation of habits of obedience and attention," and in our best infant schools this idea is to a large extent carried out, but one of the physiological requirements for the free development of the body of a child of three is opportunity for sleep in a suitable position and atmosphere, and this is not provided for in most of our babies' classes. It is a common occurrence on visiting a babies' class in the afternoon, to find that during the progress of a lesson many of the little ones have fallen asleep in all kinds of unsuitable posi-

tions and in an atmosphere certainly not of the best. I imagine the cost of the necessary equipment is the reason why sleeping hammocks are not more often provided. Another reason why our present ordinary infant school is unsuitable for very young infants is the absence of an official equivalent to the "femme de service" of the French infant school. The work done by this official in attending the children to their offices and inculcating habits of cleanliness and decency, is of very great educational value.

It is noteworthy that most continental countries make more and better provisions for the care of their infant population than are made in this country.

The chief argument used against the bringing together of young children into institutions is the danger of infectious disease, and there is no doubt that attendance at school is attended by this risk; but if the children do not attend school they are still subject to the risk of diseases being taken at school by older children and conveyed to the infant at home. And again, if the children are in school the notification of suspected infectious disease, especially non-notifiable diseases, by head teachers enables us, if right use be made of the information, to combat the spread of infection and to reduce the mortality.

The ideal method of dealing with children who need supervision would be somewhat upon these lines. The work of the health visitor, infant consultations, etc., should be extended to the end of the second year of the child's life and be worked as at present, partly by officials and partly by voluntary effort. At the end of the second year the child could be admitted to a nursery school, which on economic grounds would be best established by the local education authority, organised upon similar lines to that suggested by the consultative committee's report upon the school attendance of children below five years of age. This nursery school would contain the children over two years and the present babies' class of our infant schools, say, children from two to five. The question then arises whether this nursery school should be limited to those needing constant supervision or be open to all.

Children with good homes are better at home until the age of compulsory attendance is reached, *i.e.*, five years, and if the above proposals were extended to all the cost might be prohibitive. But surely, if the children are worth looking after during the first year and from three onwards, it is false economy to disregard them between the important ages of one and three; and if some such scheme as here outlined were adopted, especially in poor districts, the unfortunate little ones would be under

continuous supervision instead of intermittent as at present. There are many difficulties in the way, but they would not be insurmountable.

The premises of the nursery school would need to be exceptionally good, inasmuch as younger infants are even more dependent upon light, air, and sunshine than older children; the playgrounds would need to be extensive and partly shaded; the furniture should consist of light tables and chairs, aud net hammocks for sleeping accommodation. The nursery school would of necessity be attached or close to the infant department, or possibly in many districts one nursery school would suffice for several infant schools.

In addition to the teaching staff a woman should be attached to the school to attend the children at the offices and induce them to learn cleanly habits, and to wash them when necessary. The school nurse should visit the school daily with a view to the early detection of infectious disease, and the school medical officer should also make frequent visits. By this means, even if the nursery school did somewhat increase the incidence of the common and frequently disregarded infectious diseases, the parents could be warned and such measures taken that the mortality would actually be lessened.

There would be no difficulty in getting the attendance of those children whose parents desired to go to work, although there might be in the case of children of neglectful parents; but we should have the opinion of the health visitor as to the surroundings and the desirability of individual children attending the nursery school which, if endorsed by that of the medical officer of health or school medical officer, in those areas where the two offices were not combined, and embodied in a certificate, should be made sufficient to enforce attendance.

The nursery school would, I am afraid, be somewhat more costly per head than our present infant schools, and this should be partly met by a capitation grant from the Board on the basis of that for older children.

MRS. VLIELAND (Exeter) remarked that in order to ensure better care of our children they must be under supervision from infancy to school age. She suggested the necessity of the health visitor keeping children under supervision till they reach that age, and of babies' welcome clubs being available for that period. She considered from the age of one year to three years a very important stage in child life. The health visitor ceases to visit at one year; at this time the child was or should be weaned, and then it was often very improperly fed, and it was most liable to infectious diseases, such as measles and whooping cough.

MR. PAUL SWAIN (Plymouth) said their infant mortality had been very high, but they had reduced it very materially. Last year they reduced it from 128 per 1,000 to 115. They were one of the first municipalities to appoint a female health visitor, and that he considered had had a very material effect in reducing infant mortality. Another cause was the notification of measles. The deaths from measles and whooping cough, he believed, exceeded the deaths of all notifiable diseases put together, and this arose to a very great extent from the fact that people did not attach any importance to measles as a fatal disease, and that feeling extended to county councils. With regard to the notification of measles, the statistics showed that during five years they had reduced the mortality from measles 50 per cent. Then there was one other point with regard to that fatal disease, infant diarrhœa. They had had a frightful epidemic in Plymouth, and children were dying in large numbers. They took them into their hospital, and treated them with an injection of sterilised sea-water, and the result was marvellous. Owing to the munificence of Mr. and Mrs. Astor, they had established day nurseries in Plymouth, and he believed those would have a considerable effect in the reduction of infant mortality.

ALDERMAN JULYAN (Poole) said the greatest difficulty they had to face was the lack of interest taken by the majority of members of local governing authorities on this question. If there was one body of people who wanted to be personally educated it was the people who filled the chairs at their local Councils.

Pulmonary Tuberculosis in Children, by H. HYSLOP THOMSON, M.D., D.P.H., County Tuberculosis Officer, Herts.

TUBERCULOUS infection during the early years of life is a question of paramount importance to all who take a practical interest in infant hygiene and child study, and at the present time, owing to recent legislation, public interest and thought are focussed on the whole problem of tuberculosis.

Until within comparatively recent time tuberculosis of the lungs was regarded as a disease of relatively rare occurrence in children. The reason why this view was almost universally held is to be found in the fact that the clinical picture which many cases of pulmonary tuberculosis in children present differs in many respects from that observed in adult life. The recent stimulus which has been given to the study of this interesting problem we owe to that branch of preventive medicine which has directed so much thought to the preservation of the life and health of the infant and child. As a nation we are compelled to conserve the health and life of the child, for we have not only to face an ever-increasing tide of emigration, but the indisputable fact that the trend of modern civilisation is towards an ever decreasing birth-rate. A healthy and vigorous childhood is an asset of immeasurable value to the nation; is, in fact, a *sine quâ non* to national life and vigour. And of all infective diseases tuberculosis is one of the most easily preventable, while in studying the problem of pulmonary tuberculosis in children we are no doubt considering at the same time the *fons et origo* of many cases of the disease in adult life.

INCIDENCE OF PULMONARY TUBERCULOSIS IN CHILDREN.

It is only within the last few years that the frequency of pulmonary tuberculosis in children has come to be recognised in this country. Very considerable diversity of opinion, however, still exists as to the extent to which the lungs are involved in children. This diversity of opinion is based on the methods of examination adopted. Thus the percentage is low when the diagnosis is based on symptoms and physical signs alone, but it becomes much higher when X-ray examination, tuberculin reactions, and bacteriological findings are called in as diagnostic aids.

The observations of Calmette, Hamburger, and McNeil have shown that infection with tubercle during the first year of life comparatively

rarely occurs, but that after that age it increases *pro rata* with the age of the child, until between the ages of 5 and 15 some 80 per cent. show evidence of infection.

Moreover, the trend of modern medical opinion inclines to the view that the lung is the primary seat of tuberculous infection. Prof. Neitner quotes, in support of this view, the researches of Ghon of Prague, whose figures show that out of 184 post-mortem examinations 95 per cent. showed the primary focus to be in the lung.

Some years ago Greenwood published some remarkable figures on the prevalence of pulmonary tuberculosis in children. Out of 338 school children examined thirty-four, or about 10 per cent., had pulmonary tuberculosis. These figures at the time were received with a certain amount of incredulity, but in the light of more recent knowledge, based on tuberculin reactions and post-mortem findings, they do not appear to exaggerate the prevalence of the disease. The tuberculosis dispensary will reveal in time the frequency with which tuberculosis of the lungs is present under the age of 15. In Glasgow there passed under my observation in one quarter 779 patients of all ages and both sexes suffering from various diseases of the chest, but chiefly phthisis, and of this number forty-three were children, in whom there existed unmistakable evidence of the presence of pulmonary tuberculosis. The oldest child was 15 years and the youngest 8 months. In thirteen there was a definite history of hæmoptysis, in nine the disease was bilateral, and in six cavitation existed.

The contention that pulmonary tuberculosis is a common disease of childhood is further substantiated by post-mortem findings. Lapage and Mair out of 323 necropsies found evidence of tuberculosis in 150, and of this number pulmonary tuberculosis was present alone in 14 per cent., and in 54 per cent was associated with tuberculosis elsewhere. In twenty-five of these cases cavitation was present, in eleven the cavity being at the apex.

These figures go to prove that pulmonary tuberculosis is a common infection in children, although it may frequently exist in a form not readily detected by stethoscopic examination. But we propose to carry this inquiry a step further, and to show that tuberculosis of the lungs, as a morbid entity which can be recognised clinically, is more frequently met with in children who are in contact with cases of tuberculosis than in those who are not. In children under the age of three or four, when the disease is present in a form which can be detected by definite physical signs, *e.g.*, crepitations, my experience is that the patient is almost without exception a contact. Two illustrative cases may be cited. A

little girl aged twelve months displayed all the classical symptoms of consumption, and medium-sized crepitations were audible all over the left lung. The child had been nursed by her mother who had a chronic cavity in the left upper lobe. A boy aged nine had enlarged tonsils and adenoids, tuberculosis of the right cervical glands, persistent evening pyrexia and dullness with crepitations over the right upper and middle lobes. A sister had died in infancy from wasting, and a younger brother had also pulmonary tuberculosis with fever and hæmoptysis. The appearance of the mother being suspicious I examined her and found an old-standing, smouldering lesion in the right lung.

Several observers have published figures in support of this view regarding the prevalence of tuberculosis of the lungs amongst contacts Wade examined a series of cases and found that a near relative had been affected with tuberculosis in 30·6 per cent. of tuberculous children compared with 8·9 per cent. of children taken at random. Angus found evidence of pulmonary tuberculosis in 3 per cent. of contacts compared with ·7 per cent. in other children. Miller and Woodruff, in "A study of the children of tuberculous parents," found that in a series of cases inspected tuberculosis was present in 51 per cent., but only in 1 per cent. did it occur in the bones or joints, whereas 71 per cent. presented definite pulmonary signs. Halliday Sutherland gives the results of the examination of 723 contacts; of this number 290 were suffering from tuberculosis of the lung, and 13 had other forms of the disease: of the total number 372 were under the age of fifteen. The number of children in contact with non-infectious patients was 211, of which 43·6 per cent. were infected, whereas of 161 in contact with infectious patients 74·5 per cent. were infected.

From these figures and from the results of clinical observation, we conclude that the type of pulmonary tuberculosis in children, which can be definitely diagnosed from symptoms and physical signs alone, is most frequently met with in contacts, and is undoubtedly of human origin. Further observations, however, are necessary on the frequency of obscure latent tuberculosis of the lungs among non-contacts, and the incidence of tuberculosis of bones, joints, and glands among contacts compared with the incidence of pulmonary tuberculosis.

Type and Invasion.

Considerable difference of opinion exists as to the channels through which tubercle bacilli reach the lungs, joints, glands, etc., in children, and as to the type of bacillus, bovine, or human, which is the most frequent

causative agent. Many authorities hold that the bovine bacilli play a relatively insignificant part in the production of tuberculosis in children. Recent observations, however, point to the probability that a very considerable proportion of non-pulmonary tuberculosis in children is bovine in origin, and that a larger proportion of cases of pulmonary tuberculosis in children is of bovine origin than is the case in adults. Fraser investigated the type of bacillus in 70 cases of tuberculosis of the bones and joints in children under the age of twelve. In 41 the bovine bacillus was present, in 26 the human bacillus, and in three a mixed infection with both types. These results are significant, but still more significant are the facts obtained by investigating the relationship between the type of the bacillus and the age, family history, and milk supply of the child. The facts obtained by Fraser are (*a*) that under the age of three there were 23 cases of bovine infection to 5 of human; (*b*) that in cases with a history of pulmonary tuberculosis in the family the percentage of human bacilli was as high as 71, whereas in the cases with no family history it was only 17; and (*c*) that of the 25 cases brought up on human milk, in only six was the bovine bacillus found, whereas out of 41 nourished on cow's milk, in no less than 37 was a bovine infection present.

The investigations of the Royal Commission on Tuberculosis have shown that infection in children by way of the alimentary tract is frequently of bovine origin. Of 28 such cases examined by the Commission, exactly half were infected with bovine tubercle. Further, it was observed that when the generalized disease was due to human tubercle bacilli, it was more severe and widespread than when the infection was due to the bovine bacilli. It was suggested in the report that the child possessed a higher degree of resistance to bovine tubercle than to human tubercle, and this suggestion is significant as it harmonises with certain conclusions drawn from clinical observations. The investigations of the Commission also included the bacteriological examination of the sputum from 29 patients. Of this number, tubercle bacilli of the human type was the virulent agent in 27 and in two the bacilli obtained were of the bovine type. Tubercle bacilli of human or bovine type may reach the lungs by one of three routes (1) through the air passages by inhalation (2) via the tonsils or naso-pharynx, and cervical glands to the apex of the lung, or through the bronchial glands to the root of the lung, and (3) by ingestion through the alimentary tract, and hence by the lymph stream and circulation.

In the light of these investigations we must therefore accept the proposition that in a very definite proportion of cases of tuberculosis in

children, the bovine type of bacillus is the infecting agent. To what extent, if any, the type of pulmonary tuberculosis in children which can be detected by definite physical signs, *e.g.*, crepitations, is of bovine origin, it is not possible to say, but I incline to the opinion that it is invariably due to infection with the human bacillus. On the other hand it is probable that the slowly progressing, obscure type of the disease so frequently met with in childhood and so difficult to diagnose, is in many cases of bovine origin. Clinically these two types are sharply defined. On the one hand we have an active well-marked type of the disease conforming closely to that met with in adult life, and on the other hand an obscure, slowly progressing or latent type which, owing to the absence of definite physical signs and marked constitutional disturbance, does not present a clinical picture which can readily be recognised.

Relation to Pulmonary Tuberculosis in the Adult.

The presence of pulmonary tuberculosis in the child in latent or quiescent form must bear some causative relationship to the disease in adult life. There is no difficulty in accepting this view in cases in which the infection in children is definitely of human origin. When the disease does not prove fatal it may become quiescent or arrested and remain so for life, or it may undergo a process of complete healing. We all know, however, that pulmonary tuberculosis may become activated after a prolonged period of complete quiescence, and a quiescent focus of pulmonary tubercle in a child is very liable to be fanned into fresh activity during puberty or adolescence. This characteristic of tuberculosis of the lungs is met with at all ages, and is familiar to every physician.

If, however, we accept the view that a certain proportion of cases of latent pulmonary tuberculosis in children is due to bovine infection, and that this type of the disease may give rise to active pulmonary manifestations in adult life, we are compelled to premise the mutation of the bovine into the human bacillus as a result of prolonged residence in the human host. Orth claims that the convertibility of one bacillus into the other was decided by Von Eber, who in 1912 stated that he had been able by one or more passages through cattle to produce from adults (36 per cent.) and from children (53 per cent.) a virulent bovine bacillus. A further point bearing on the possible causative relationship between tuberculous infection in the child and pulmonary tuberculosis in the adult has been investigated by Orth. That observer showed experimentally in 1906 that a primary local infection with inoculated bacilli could create a heightened latent susceptibility to future infections, of which pulmonary tuberculosis

was the most usual sequel. Further investigations, however, are necessary with regard to the relationship of the bovine bacillus to pulmonary tuberculosis in the adult, and the extent to which mutation of one bacillus into the other takes place.

The possible relationship between pulmonary tuberculosis in the child and the disease in adult life may be summed up as follows:—

1. Infection in childhood may induce a latent susceptibility to pulmonary tuberculosis in later years.

2. A pulmonary infection with human bacilli may take place during childhood, but the disease remains quiescent until puberty or adolescence is reached.

3. A pulmonary infection with bovine bacilli may take place during childhood, and these by prolonged residence in the human host become converted into bacilli of the human type and consequently become more virulent.

4. Apart from actual pulmonary disease tuberculosis of the bronchial glands, which is so frequently met with in childhood, will predispose to pulmonary tuberculosis by interfering with lymphatic drainage. There is probably a causative relationship between tuberculosis of the bronchial glands and tuberculous pleurisy in later years.

DIAGNOSIS.

The diagnosis of early pulmonary tuberculosis in children, more especially the latent form, by ordinary clinical methods, presents a problem of very considerable difficulty. The disease is very liable to be overlooked in children, for not only are physical signs frequently indefinite, but a careful examination of the chest in a restless child is impossible, and crepitations which might be heard at the end of deep inspiration or after coughing can seldom be elicited. Moreover, owing to the frequency with which emphysematous areas develop, the presence of definite tuberculous lesions may be completely masked, so that very indefinite physical signs may be associated with very considerable morbid changes. The following case illustrates the discrepancy which may exist in childhood between the physical signs of pulmonary tuberculosis and the character and extent of the lesions actually present. A. M., a boy aged eight, had been in failing health for some time. He had a slight cough but no expectoration; he was thin, anæmic, and feeble, with a rapid pulse and irregular temperature; although tubercle was suspected, careful and repeated examination of the chest failed at first to reveal any definite physical signs. Later on, however, the percussion note became impaired over the right upper lobe,

and some crepitations were audible in the left inter-scapular region. Before death took place from asthenia the sputum, which was scanty but muco-purulent, was found to contain tubercle bacilli, and a hyper-resonance note was obtained over the left lung in front; physical signs remained ill-defined to the end. The necropsy revealed extensive tuberculosis in both lungs. In the right upper lobe there was consolidation, and in the left upper lobe a central cavity was found, elsewhere in both lungs small caseating areas were discovered. Superficially the lung tissue was emphysematous, and this, no doubt, explained the indefinite nature of the physical signs in the face of such gross morbid changes.

From the point of view of diagnosis, pulmonary tuberculosis in children may be divided into two types, one in which the physical signs approach in character those observed as significant of the disease in adult life, and the other in which the physical signs are obscure and ill-defined. It is in consequence of the existence of these two distinct types that so much diversity of opinion has existed with regard to the presence of the disease in children. In the first type the diagnosis of the disease is a comparatively easy problem, as it can usually be made from the personal history and stethoscopic examination. The majority of such cases are contacts, and the diagnosis is based on definite physical signs, *e.g.*, crepitations, evening pyrexia, hæmoptysis, etc. When the sputum can be obtained tubercle bacilli are frequently found.

In contrast to this definite clinical picture is the type in which the physical signs are so indefinite as to be untrustworthy as a guide to correct diagnosis. Many patients belonging to this class display, however, certain stigmata of tuberculous infection. They are frequently phthisical in appearance, and in many there is a luxuriant growth of fine hair on the back. The lymphatic glands in the neck and axilla are frequently enlarged, although not to a marked extent, and dilated veins are observed coursing over the front of the chest. Adventitious sounds are very rarely detected, but careful examination usually reveals some impaired resonance to percussion with altered breath sounds and voice resonance. Such cases are "suspects," and the diagnosis has to be confirmed by X-ray examination or a positive tuberculin reaction. Jordan emphasizes the importance of X-ray examination in revealing the presence of tuberculous lesions, especially at the root of the lung, when the disease cannot be detected by ordinary stethoscopic examination. Lapage confirms the views of Jordan. As a result of between 300 and 400 examinations, he concluded that the majority of children living in large towns present evidence of tuberculous infection after the age of 6 to 8 years, and that in the majority

of cases pulmonary tuberculosis in children commences at the root of the lung. These observations support the view, based on clinical experience, that pulmonary tuberculosis frequently occurs in children in a form which cannot readily be diagnosed by ordinary stethoscopic examination.

PREVENTION AND TREATMENT.

There is urgent need for increased effort to control the spread of the various forms of tuberculosis in children, for while there has been a striking decrease in the incidence of the disease amongst adults, a proportionate decrease has not been observed amongst children. In our efforts to control the incidence of pulmonary tuberculosis in childhood we must direct our attack along two main lines, one aiming at raising the resistance of the child to infection with tubercle, the other aiming at the prevention of infection by restricting the output of the offending organism. The resistance of the child to tuberculous infection depends in part at least on inheritance, but there also exists the possibility of ante-natal infection. So long, however, as we permit persons with definite tuberculous lesions to marry, we shall have children born in whom sooner or later the tubercle bacilli will gain a footing. This question has a direct relationship to sanatorium administration, for I know of several unions not made in heaven, but in the sanatorium. Certain diseases, such as measles and whooping cough, undoubtedly pave the way for pulmonary tuberculosis in children. The youngest case I have seen in which tubercle bacilli were found in the sputum was a child aged 5, who developed active pulmonary tuberculosis after whooping cough. Parents should, therefore, be warned against the dangers of these diseases, and of the risk they run in exposing their children to possible infection. It is almost unnecessary to emphasize the importance of healthy home conditions, good food, and efficient school ventilation, in raising the standard of the child's resistance to infection with tubercle. It is here that all who take a practical interest in infant hygiene and child study find a sphere in which to take an active part in the preventive war against tuberculosis.

The second line of attack must aim at preventing infection by restricting the output of the bacilli of tuberculosis. There are two great sources of infection, the spit of the advanced consumptive and milk from tuberculous cattle. To protect the child from the sources of infection, certain rigid precautions must be carried out in the home in the case of children who are in contact with an open case of the disease. The segregation and treatment in hospital of advanced cases of the disease, if successfully carried out, will have a far-reaching effect in decreasing the

incidence of the active type of pulmonary tuberculosis in children. Of almost equal importance is the protection of the infant and child from drinking milk containing bovine bacilli. Indeed, the whole question of an active prophylactic campaign against the *fons et origo mali* may be summed up in the words "segregation of advanced cases and a pure milk supply." But while it is true that prevention is better than cure we must not overlook the importance of treatment. The young child is peculiarly susceptible to the influences of an improved environment, and his resistance and recuperative powers quickly respond to suitable treatment. Active and acute cases require sanatorium treatment with absolute rest in bed under perfect hygienic conditions. The effect of rest in controlling injurious auto-inoculation in children is very marked. In the absence of fever or other serious constitutional disturbance it will be found as a rule that the child speedily responds to open-air treatment. It would almost seem as if by his restless movements he cured himself by induced auto-inoculation. In many children with quiescent disease the improved conditions and general supervision associated with the open-air school will result in marked improvement in both the local and general condition. In latent cases in school children, where the disease is suspected though ill defined, and is associated with some degree of ill-health, it is advisable to keep the child from school for a time, to treat him on open-air lines, and to take daily observations of the body temperature. Notwithstanding all that has been done in connection with the treatment of tuberculosis, fresh air and cod liver oil still constitute a most useful combination in children. Tuberculin may also be employed in treatment. It should be combined with ordinary hygienic and dietetic measures. Children below the age of ten will be found to do well without it, but as the age of puberty is approached a course of tuberculin carefully administered will prove of value in minimizing the risk of relapse at that crucial period.

The results obtained by the appropriate treatment of tuberculosis of the lungs in children are on the whole good. Indeed, the prognosis is probably more favourable under the age of 15 than at any other period of life. Acute and progressive cases, however, do occur, and miliary tuberculosis of the lungs is not infrequently met with in children. The only case in which I have seen subcutaneous emphysema as a complication of pulmonary tuberculosis was that of a child aged 6, in whom the disease was of the miliary type.

The Significance of Bronchitis in Children, by JOSEPH CATES, M.D., D.P.H., Medical Officer of Health, St. Helens (MEMBER).

THOSE engaged in the medical inspection of school children will probably agree that some amount of bronchitis is relatively common in children comprising the entrant group. Among 3,500 entrants systematically examined by the writer, signs of bronchitis were found in 201 cases, or about five per cent. The causes of the condition are not unlikely as complex as those of malnutrition with which bronchitis is frequently associated. The downward extension of a cold in the head, measles, whooping cough, chronic infection of the mouth. nose, and throat may directly lead to bronchitis, whilst deformities of the chest or spine, enlarged tonsils and adenoids by restricting the respiratory movements predispose to the disease. Unhygienic homes and particularly dark ill ventilated bedrooms cannot fail to aggravate the complaint, and parental ignorance often allows a vicious circle to be established. Owing to recurring attacks of bronchitis the child is kept heavily clothed, expansion of the chest and free movement of the limbs are restricted, the skin always moist becomes susceptible to changes of temperature, and fresh air is avoided lest the child should take further cold.

In order to obtain some information of the after history of children suffering from bronchitis at the time of medical inspection, a careful re-examination of these cases was undertaken about a year from the date of the first examination; the result was surprising, and revealed the seriousness of the condition. Of the 201 children, six showed definite signs of pulmonary tuberculosis, five were in a condition which might well be described as pre-tubercular, in forty-eight bronchitis was still present, ninety-one were apparently free from the disease, and fifty-one for various reasons could not be re-examined. That three per cent. of those originally suffering from bronchitis should have developed well-marked evidence of phthisis and over two per cent. signs highly suggestive of the disease seems to show that bronchitis in children is a more important ailment than it is generally understood to be.

With regard to the treatment of these cases a child found to be affected with bronchitis should be followed up and re-inspected at frequent intervals; fortunately improvements in the hygiene of the home, free meals for the ill-nourished, and suitable treatment of the predisposing causes will bring about an improvement in many instances. For the more

persistent forms of the disease open-air classes, attendance at an open-air school, or a country holiday will be indicated. Of the latter I am able to speak with some confidence; I have seen children who have had prolonged attacks of recurring bronchitis apparently completely cured by six weeks' stay on a farm; the disadvantages are loss of education and lack of efficient supervision, both of which can be obviated by the establishment of residential schools. But the treatment of each case of bronchitis, although of the greatest possible benefit to the individual, hardly touches the fringe of the problem. The extending scope of preventive medicine must seek to guard the child from birth. Health visitors working under the Notification of Births Act must preach the gospel of clean homes, clean food, and the open window. Mothers should be encouraged to bring to "Welcomes" not only their infants but other children under school age, so that appropriate instruction may be given. Suitable and sufficient ventilation of class rooms and cloak rooms must be obtained, and what is more important but more difficult, teachers themselves must be taught to appreciate the value of fresh air. Early attendance at a day nursery may be made the starting ground for breathing exercises and pocket handkerchief drill, to be continued on entering school, where nose, throat, and teeth defects should receive appropriate treatment. Senior girls in the elementary schools should be systematically instructed in mothercraft, and some provision must be made to bridge over the interval between school age and womanhood: a period in which it is to be feared much of the instruction received at school is apt to be forgotten.

Preventive medicine restricted to infancy will to some extent be ineffective, and school hygiene will be handicapped until the authorities entrusted with education and public health unite to care for the physical welfare of the child under school age.

Mothers' and Babies' Welcomes, or Schools for Mothers, by PHILIP BOOBBYER, M.D., M.S., M.R.C.S., Medical Officer of Health, Nottingham (FELLOW).

I HAVE undertaken to say a few words on the above subject, to point out the special *raison d'être* of such schools for mothers, some of the various subsidiary directions in which they may prove of value, the method of working them, and lastly the method of establishing and organising them.

These schools for mothers first came into being on the Continent as a means of combating the causes of excessive infant mortality. Madame Coullet, of Paris (the wife of Professor Coullet), inaugurated, in the nineties, a scheme for succouring and feeding nursing mothers. The central idea of her scheme was to persuade and enable poor mothers to give their natural food, breast milk, to their babies. To this end she provided cheap and free meals, at restaurants in various parts of Paris, for all poor mothers who would undertake to feed their babies at the breast.

The scheme proved a great success. Many poor mothers were, and are, unable to feed their babies in this manner through lack of proper nourishment, and the provision of good and suitable food for their own personal needs not only enabled them to do so, but served also as an object lesson in economical and suitable dietary which they could utilise in their homes when they should have an opportunity.

I have not time to go thoroughly into the further local history of such schemes. Suffice it to say that they were inaugurated at Ghent in Belgium, at different places in Germany, and elsewhere on the Continent, and also in America, and subsequently in this country, St. Pancras being the pioneer establishment so far as England was concerned (1907), and Nottingham next (1908).

The special object of the movement, then, is to secure the proper care and nourishment of the mother and infant, and principally of the infant. Infant mortality has reached such a terrible figure, especially in the great commercial centres of modern civilisation, as to constitute a grievous scandal.

We are told that the co-operative societies of Ghent in Belgium, by feeding, instructing, and generally succouring expectant and recent

mothers, succeeded after a few years' work in reducing the infant mortality from about 350 to some 40 per 1,000.

This reduction of excessive infant mortality it is the ultimate object of the Mothers' and Babies' Welcomes to promote, and I will give you a few facts and figures to emphasise the necessity for such remedial work as they are set to perform. Urban districts have, almost invariably, higher infant death-rates than rural districts, and the denser and poorer the urban, and the sparser populated and more rustic the rural, the wider the difference.

If we contrast the infant death-rates of counties (in England and Wales) in which urban and rural conditions, respectively, predominate, according to the method of the Registrar-General, we find a very striking difference in favour of the more rural areas.

Infant Death-Rates in certain Counties of England and Wales (Registrar General's Ann. Rep.).

Registration Counties with Highest Rates of Infantile Mortality.	Deaths of Children under one year to 1,000 Births.	Registration Counties with Lowest Rates of Infantile Mortality.	Deaths of Children under one year to 1,000 Births.
	England and	Wales, 105.	
Carmarthenshire... ...	136	Middlesex	73
Lancashire	129	Somersetshire	73
Durham	128	Surrey	72
Glamorganshire	126	Berkshire...	69
Nottinghamshire ...	121	Wiltshire	69
West Riding of Yorkshire	120	Oxfordshire	67
East Riding of Yorkshire	120	Hertfordshire	63

This fact obviously suggests the desirability of introducing the *rus in urbe* as far as possible into our towns and cities, which is the special aim of the garden city movement.

In very bad urban districts, like those of the Exchange District of Liverpool, and the Carter Gate–Manvers Street area of Nottingham, the infant death-rate in very ordinary times and seasons (*e.g.*, during 1909) has risen to between 250 and 300 per 1,000 births, when the rates for the entire cities were about 140 to 150, and those of their good-class neighbourhoods (*e.g.*, Sefton Park, in Liverpool; the Park, in Nottingham) were as low as about 60 or 70.

It is interesting to compare the rates in certain foreign countries and British colonies with our own:—

Infantile Mortality—Deaths of Children under one year to 1,000 Births, 1896-1900, and 1910. (Registrar-General's Ann. Rep.).

Country.	Years.	
	1896-1900.	1910.
Chili	333	313
Russia (European)	261	—
Austria	226	—
Hungary	219	194
Prussia	201	157
Jamaica	175	188
Spain	175 (?)	—
Ceylon	168	176
Italy	168	—
Japan	153	—
Servia	159	—
Belgium	158	—
Bulgaria	143	—
France	159	—
England and Wales ...	156	105
The Netherlands	151	108
Switzerland	143	—
Finland	139	118
Scotland	129	—
Denmark	132	—
Ontario, Province of ...	—	123
Ireland	106	95
Australian Commonwealth...	112	75
Sweden	101	—
Norway	96	—
New Zealand	80	68

This list of rates shows plainly that, high as our infant death-rate is, it is not so high as the rates of many other civilised nations.

Let us now examine the death-rates of legitimate and illegitimate infants, respectively, in towns and country districts. In towns the death-rates of illegitimate infants are more than double those of the legitimate, whereas in country districts they are only about 50 per cent. higher. These ratios hold good very generally whenever large numbers are dealt with.

An analysis of the deaths under one year, in respect of the periods of the year in which certain proportions occur, of some of the causes to which they are due, and of the sexual incidence of certain causes, is highly interesting.

Some figures for my own town of Nottingham, during the past five

years, correspond very approximately with those furnished by the Registrar-General, and other authorities, for other places, and may therefore be taken as typical.

Of the deaths under one year in Nottingham, about 18 per cent. occur in the first week, 29 per cent. in the first month, and 52 per cent. in the first three months.

Unfortunately, developmental and wasting disorders, originating in ante-natal causes (*e.g.*, premature birth, congenital defects, atrophy, debility, marasmus), constitute over 60 per cent. of the deaths under three months, and these being beyond the reach of ordinary preventive agencies, but little reduction is to be looked for in the mortality they occasion, unless the reproductive vigour of the race should undergo improvement.

Another point of interest and importance is the excess of the male infant mortality above the female. This is given by the Registrar-General as generally about 24 per cent.; and, as this excess, to the amount of about 23 per cent., obtains also under the heading of premature birth and other like causes, which account for about three-fifths of the total mortality in the first three months of life, it follows that a very considerable proportion of the preponderant male mortality, as compared with the female, is practically beyond the reach of prevention.

Now, a few words about epidemic diarrhœa. This is specially fatal in infancy and old age. The highest mortality is in the first year between the third and ninth months. The disease, to a very large extent, is due to food poisoning. Breast-fed children are mostly exempt. The mortality among illegitimate children from diarrhœa is always high, even in non-epidemic years. The liability to attack and the mortality, alike, are greater for male than female infants. About 70 to 75 per cent. of all deaths from diarrhœa are under one year, and 80 per cent. under two years of age.

But to return to the subject of the Welcomes. In this country, and in centres like Nottingham, where the Notification of Births Act is in operation, the lady inspector who visits the lying-in mothers in their homes, sends them or brings them down to the nearest Welcome as soon as they are able safely to leave their homes after confinement. Besides being taught to feed their babies at the breast, and being themselves supplied, when necessary, with wholesome and nutritious meals to enable them to do so, the mothers are shown how to clothe, wash, and manage their babies: they are encouraged to bring them to be weighed, and to compare their weights with those of other babies; they are taught by volunteer committees of ladies to make up their own and their infants' clothing, to make cradles out of banana-boxes, being specially warned not to have their babies in

bed with them. Classes for teaching simple cooking, domestic hygiene, and other like subjects are also regularly held. A staff of medical men and women (one each in rotation) attend twice weekly at the Welcomes to give advice to mothers about their own and their babies' health, and any ailments from which mother or child may suffer. Treatment is not given except in emergencies (such as those which occur at times of diarrhœa prevalence), but the mothers are put in the way of obtaining it, and the nature of any ailment discovered is as far as possible fully explained to them.

The following statistics of attendances at the Welcomes, of dinners provided, and of new babies brought during the summer of 1912, will give a fair idea of the amount of work done at and in connection with these establishments at the present time:—

Nottingham Mothers' and Babies' Welcomes Data for Summer of 1912.

	Attendances.	Dinners.	New Babies.
May.			
Howard Street ...	426	207	18
Alfreton Road ...	737	200	38
London Road ...	458	220	17
	1,621	627	73
June.			
Howard Street ...	558	352	19
Alfreton Road ...	678	199	37
London Road ...	631	202	27
	1,867	753	83
July.			
Howard Street ...	477	274	24
Alfreton Road ...	823	300	60
London Road ...	827	232	60
	2,127	806	144
August.			
Howard Street ...	532	278	26
Alfreton Road ...	1,044	275	43
London Road ...	519	191	39
	2,095	744	108

In addition to the meetings held directly in aid of nursing mothers and young children, we have others (*a*) of midwives, convened by the lady inspector under the Midwives' Act, partly for the special instruction of midwives, and partly to bring them into rapprochement with the various aims of the Welcomes, (*b*) of district visitors, and other persons engaged in visiting among the poor, held for the purpose of securing the assistance

and co-operation of such persons in persuading mothers to visit the Welcomes, and to regard them as a species of mothers' club, where the latter could not only find succour for their various needs, but where they could also meet other mothers in similar circumstances to themselves, and compare notes upon many matters of common interest.

Classes of girls approaching the leaving age (13 years) at the public elementary schools, are now instructed by the Welcome matrons in the feeding and rearing of infants, and in various branches of domestic hygiene and domestic economy.

Books are kept in which are recorded particulars of the home surroundings, financial circumstances, and personal condition of each mother and child attending the Welcomes, and facts concerning them as they come to the knowledge of the officers are regularly entered up.

The walls of the Welcome rooms are decorated with handbills, pictures, and diagrams dealing with and illustrating various subjects connected with domestic life among the poor, *e.g.*, the dietetic value and the cost of food-stuffs, elementary physiological facts, and warnings of various kinds.

The Welcomes, in the near future, will probably be incorporated with the Tuberculosis Dispensary Scheme. It is proposed that they shall be used as branches of the Dispensary, especially for the examination of tuberculous children, at times when they are not required for their primary purpose.

A few words now about the methods of establishing and organizing these institutions. Mrs. Sidney Webb has said that what we should endeavour to secure in this connection is "voluntary work in a municipal setting." In my own town of Nottingham we have succeeded in doing this in a manner, and to an extent, which leaves little to be desired. Prominent and wealthy local philanthropists pay the rent of the houses, which for the most part are furnished, equipped, and maintained by the aid of public subscriptions. The municipality appoint and pay the several matrons. These are well-educated women, fully trained and certificated as nurses and sanitary inspectors. They are appointed as health visitors under the Notification of Births Act. The superintendent and secretary of the Welcomes is the chief health visitor under this Act.

The whole Welcome scheme is in charge of a large and representative committee, and each Welcome is managed by a sub-committee of ladies, and the sub-committees vie with each other in endeavouring to promote the successful development of the institutions. The medical officers attached to the Welcomes are members of the general and local committees.

In addition to the work peculiar to these institutions, the superinten-

dent of midwives, as stated above, and other officers of the health and housing departments are encouraged to cultivate a rapprochement with them.

This rapprochement between the officers of various sections of the health and housing departments promotes a general solidarity of the whole department, and causes the workers to realise that they are all labouring in one field of material, social, and moral improvement for the poorer classes. Each officer comes to perceive that his or her special work is only part of a general scheme, and that the several parts of the latter are inter-dependent and mutually helpful.

Housing reform, which holds the field as remedial health work in public estimation at the present time, must go hand-in-hand with instruction in all that makes for healthy and happy home life, if the full benefit of such reform is to be appreciated by those for whom it is made, and the labour and expense involved in making it is to be economically justified.

Of all the ancillary agencies directed to improve the poor home from within, and to fit its tenants for life at a higher plane, there is probably none containing the germ of brighter and more solid promise than the Mothers' and Babies' Welcome.

The Administration of the Mental Deficiency Act, 1913, by Leslie Scott, K.C., M.P.

THE Bill over which we had to work so hard is now an Act, and a satisfactory Act. The Board of Control is now constituted, and the new appointments, Sir William Byrne as Chairman, Dr. Rotherham and Miss Dendy as Commissioners, are excellent. The benefits which will flow from it will depend in great measure on the wisdom of its administration.

The scheme of the Act is clear. The duty of the central Board of Control is limited to supervision and general guidance, except in regard to the institutions for defectives sent there from prisons and reformatories by the Secretary of State. In regard to that particular class of defectives the duties of the Board of Control are executive; but with that exception the executive duties of the Act are left to local authorities.

The Board of Control is given by the Act effective powers of supervision over the local authorities; but within a very wide measure of discretion the local authorities are left free to carry out the administration of the Act in the manner that seems to them best. There is no provision in the Act which imposes upon the local authorities the *obligation* of joint action. They are free, if they choose, to make common arrangements with other authorities, but they are under no compulsion to do so. The first principle upon which I desire to insist as essential to the good working of the Act is that of real, genuine and hearty co-operation between the various local authorities to whom the administration of the Act is left. This proposition will largely be accepted as obvious; but the reasons why such co-operation is essential are so strong that it is worth while to state some of them. I will then describe a proposal by which that co-operation can be successfully carried out, a proposal which, by the time this paper is published, will, I hope, have been put into practical shape.

There are certain aspects of the problem involving certain fundamental necessities which cannot but demand joint action. We have some measure of expert knowledge on the causes, and more on the treatment of cases of mental deficiency; but, broadly speaking, the science of the subject is in its infancy. I think all doctors with special experience would admit that our knowledge of the subject is mostly empirical, and very limited at that. There are many institutions, both asylums under the Idiots Act and Colonies such as Monyhull or Darenth, Hildenborough or Sandlebridge, where the patients are well cared for and are trained to the best use of their limited faculties. But, none the less, comparatively little is known

of the causes of mental deficiency or of its prevention or cure. And of the vast number of cases in need of care in the United Kingdom, estimated by the Royal Commission at over 60,000, a very small percentage are to-day receiving skilled attention. As a corollary the number of really trained and qualified persons who are teaching or looking after mentally deficient patients is very limited. But all those familiar with the subject are agreed that it is essential for the successful care and treatment of mentally deficient persons, whether children or adults, that you should have really trained persons to look after them, persons with some small degree of medical knowledge, with knowledge of character and a habit of observation, proficient in the methods of manual training, and with a skilled knowledge of the very special practical kind of teaching necessary to train these patients to the maximum capacity of their limited intelligence.

The supply of teachers of such a kind is nothing like adequate to the demand which the Act will quickly create, and a continuons supply of such properly qualified teachers will be permanently needed. For either purpose, the immediate provision or the permanent supply, it is quite obvious that local initiative by itself is not enough; we want some centralised connecting organisation to which all those locally interested in administering the Act, and therefore in need of teachers, will be able to go in order to obtain suitable teachers. I do not mean for a moment to suggest that teachers of this class can be taught their profession in some training college apart from patients. Like doctors, they must walk the hospitals; they must learn their business by going into institutions for the mentally deficient, and learning how to teach under the guidance of those who have already obtained experience. But in order to organise a sound system for training teachers to look after defectives, co-operation between the local authorities is essential.

Another reason why separate action by each local authority treating itself as a self-contained unit will not suffice, is that suitable treatment is impracticable without classification. The treatment suitable to one class of mental defective is not suitable to another, and some classes, such as those who are also epileptic, or deaf and dumb, or blind, and moral imbeciles, should be segregated, either in their own interest, or because contact with them is bad for others. The supply, so to speak, of patients in each of those classes will not be large in any one particular locality, and it is obvious that, regarding this evil as a national evil, the right thing to do is for local authorities to make joint provision of special institutions for each of these classes, where such patients can be collected from all over the country and there receive the particular treatment

which will give them the maximum of happiness of which their limited intelligence is capable.

A third reason for co-operation follows. In order to effect a suitable classification it is necessary to determine what is the class to which any individual defective belongs. Many kinds of defectives require some extended period of observation before a satisfactory determination can be made, particularly in the case of moral imbeciles. Under the Act it is provided that all defectives of violent propensities in prisons shall be sent to central institutions. There is an evil which may arise by reason of that provision; with good administration it need not, but it may. There are many mental defectives in prisons to-day who are just ordinary defective patients, and who under proper control will exhibit no violent propensities. Such cases ought not to spend their lives in an institution for violent imbeciles. If there were some clearing-house where all doubtful cases could be sent to undergo a period of observation in order that skilled persons may decide to what class they belong, it would greatly facilitate sound classification. But for that a central organisation co-ordinating all executive authorities is requisite.

The above reasons are concerned with treatment. The next considerations relate to the authorities upon whom the executive administration of the Act is mainly cast. There are four: the Board of Control, dealing with violent defective prisoners; the Local Authority, the Committee of the County Council, whose duty it is to deal with all classes that have to be dealt with under Section 2 of the Act; the Guardians, who are given powers to deal with mentally deficient paupers; and the Local Education Authorities who have under their charge mentally defective children under the provisions of the Defective Children Act of 1899. Four executive authorities; no co-ordination between them provided by the Act. In order to secure harmonious working, and that interchange of knowledge acquired by the initiative of individual experience which is the condition of progress, there should be some method of co-ordinating all these various executive authorities.

The last consideration to be mentioned is perhaps the most important. The Act creates statutory authorities; but it leaves also the whole field of effort open to voluntary initiative; and one of its great merits is that it does encourage voluntary activity of all sorts, and particularly those societies and institutions which have already done so well. These voluntary agencies, recognised and encouraged by the Act, are put under no form of compulsion to co-operate either amongst themselves or with the executive authorities that the Act creates. It is obvious that there is a

danger of great overlapping of effort and fruitless expenditure of public money unless you achieve some successful and efficient means of co-operation between these voluntary agencies both *inter se* and with the local authorities and the Board of Control. It is of the greatest importance to the Nation that these voluntary agencies should be utilised to the full.

I suggest that the right course is to rope in all the voluntary agencies and to co-ordinate them in a joint endeavour with all the statutory authorities. How is this to be done? Fortunately, the work has already been taken in hand by Sir William Chance and others, and there is in course of formation a central voluntary association for this precise purpose. It is to be called The Central Association for the Care of the Mentally Defective. The broad principle of its constitution is that there will be on the one hand a Central Council, and on the other local County and County Borough Associations corresponding to the scheme of the Board of Control and the local authorities. The local associations will, it is hoped, consist, and they must consist if the scheme is to be a real success, of representatives of all the local authorities and of the local voluntary associations, with an adequate medical representation and co-opted members. The central council will consist of representatives of these local associations, with the subscribers to the central body, and of co-opted members. The object will be to co-ordinate local effort, making it more efficient and saving public money, and generally to initiate and organise all work found to be necessary to make the Act work well in practice: to organise those things which cannot be so well achieved by uncorrelated local effort.

What will be the motive power of the new organisation? Under Section 48 of the Act, there is power to the Government to make a grant of public money to any society which has undertaken the duty of assisting or supervising defectives while not in institutions under the Act. And that will be one of the objects of this society. Under this section, if the Society is formed on such lines as indicated, there is reason to think that the Government will, on the advice of the Board of Control, make a grant to this Central Association under the powers of Section 48. If necessary, it would be possible to invoke the general power of the Board of Control to expend money on means for insuring improved treatment of defectives.

If that procedure is, as I hope it will be, followed, the relations between the Central Association, so formed, and the Board of Control will be analogous to that existing to-day between the Agricultural Organisation Society and the Development Commissioners. The Agricultural Organisation Society is a central body, whose business it is to organise co-operation and

other forms of assistance to the agriculture of the country, and under an arrangement made two years ago, and now carried out, the Development Commissioners make an annual grant to the Agricultural Organisation Society for the purpose of promoting the development of agriculture. It is very much on these lines that there is reason to hope that the Government will make an annual grant to the new Central Association for the purpose of organising and co-ordinating effort in regard to the treatment of mental deficiency. But the effect of such a grant will be to give public recognition and assistance to the work of this new Association, which will be of incalculable value in augmenting its power for usefulness. Of course, Government money will not be given except on conditions. These conditions will enable the Board of Control to be in touch with the Executive Council of the Society, and to lay down the terms upon which the Government grant will be given. In this manner, the Government will obtain that degree of control which is essential for the good distribution of public money. And, conversely, we may anticipate willingness on the part of the Society to yield up to the Government that measure of obedience which will earn the public grant; because obviously if the Society is in receipt of an annual grant from the Government, local authorities will be greatly encouraged to be represented upon the local associations and on the Central Council of the new Association. I believe that this proposal, if carried out, will fill in practice the gap that the Act has left open, namely, the absence of any provision compelling co-operation between the various local authorities, in order to ensure economy and efficiency in the administration of the Act.

The two essential needs are, on the one hand, freedom of local initiative and of voluntary initiative, and, on the other hand, joint action so that all may have the advantage of the progress achieved in any individual locality either by the statutory body or by the voluntary associations.

One or two considerations on voluntary work may be added. It is of the highest importance that we should utilise, that both the Board of Control and the local authorities should utilise, the voluntary institutions already established in the country, provided they are good, in respect both of accommodation and management. For that purpose, it may be hoped that the members of the Board of Control may between now and the 1st of April, when the Act comes into general operation, visit all the leading voluntary institutions of the country, and inform their minds as to the methods upon which they are carried on, with a view to coming to a joint decision as to which of them demonstrate the best types of accommodation and systems of treatment. Such an investigation should be of assistance

in determining the character of the regulations to be made by the Home Secretary, and upon which the Board of Control will advise him. This is particularly so in regard to regulations affecting the conditions upon which "institutions," "houses," and "homes" are to be certified or approved under the Act. It is also to be hoped that, in making the regulations, they will see fit to preserve considerable elasticity, so as to encourage individual local initiative, in view of the fact that our knowledge of the subject is essentially imperfect, and that we want, therefore, to encourage individual initiative within wise limits, in order that that knowledge may be advanced as rapidly as possible.

There has been a good deal of discussion as to what ought to be done in regard to institutions which are run for private profit. Under the Act they cannot be certified institutions, but they may be certified houses or approved homes. It is enough to say that it should be the business of the Board of Control to attach such conditions to the grant of their certificate or approval, as the case may be, as will ensure that whilst the place is run for private profit the real interest of the patients in the Home be not sacrificed for commercial reasons. It may not be possible to lay down any general conditions. The fact that the Home is run for private profit is no evidence that it will not be a good and suitable home for defective patients. There are several of the kind in the country at present which are admirable; there may be others which, perhaps, are not admirable. The Commissioners will no doubt take scrupulous care that in the conditions they lay down, they ensure such disinterested management that there is no risk of the patient being sacrificed to the income of the owner.

The next point to which I desire to draw attention is the risk of precipitate or undue expenditure of money. The temptation to spend a great deal of money is one to which local authorities are, perhaps, not always immune. To those upon whom the administration of the Act falls as a duty I would say: "Don't plunge into spending a great deal of money on big places. Start slowly; start with a small place and then let it grow." Most good institutions in this country have grown slowly. What we want to do is to ascertain as far as possible the best method of starting new institutions. For this purpose substantial help may be given to local authorities by means of this Central Association. I suggest that in general they would do well to follow the example of places like Sandlebridge, the colony so admirably conducted hitherto by Miss Dendy on behalf of the Lancashire and Cheshire Association. What is needed is plenty of room for expansion in the matter of land, so that as numbers

increase in the colony additional buildings may be put up, and classification made easy; and that there may be plenty of room for farming and gardening.

The next consideration is that we ought in this matter to begin with the children. I put aside the lowest-grade cases who can never learn anything; but in all other grades one of the most striking facts is that in childhood there is a considerable capacity for learning. But let that child grow up without learning and he will never learn anything; therefore it is of the highest importance to start with the children. This Act is aptly framed with that view. The local education authorities are left with the duty of dealing with the defective children (unless they come under the earlier sub-section of Section 2). Had the Defective Children Bill of this year become an Act of Parliament, the Education (Defective Children) Act of 1899 would have been made obligatory upon all Education Authorities. But still the scheme of the Mental Deficiency Act is to leave the children to the local education authority. There are many grades of defective children who go to the special schools; of those children some are obviously unsuited ever to become self-dependent citizens. The sooner those cases go on to the care of the Authority, whose duty it is to deal with permanent cases of mental defect, the better.

The question has been raised as to whether children who are too physically defective to go every day through the streets of big towns to attend day schools should not be put in residential schools built by the Education Authorities. Residental schools of that kind are not in reality places of education at all; they are in effect institutions where permanent defectives may be cared for during a limited period of years. It is a waste of public money to attempt to apply the Education Acts to children who can really never be educated. I do urge that in this matter, as between the Local Education Authority and the Local Authority under this Act, it is of the highest importance that there should be cordial co-operation and no jealousy on the part of the Education Authority. Let those children who can really benefit by education remain in the schools so long as there is a chance of their ever becoming capable of any degree of independence in life. When it has become apparent that those children will never benefit by education to that extent, do not treat them under the Education Act; send them on as patients, which they are, to be cared for under the Mental Deficiency Act, otherwise there will be much overlapping of expenditure, it being remembered that such patients will be "cared for" by being taught to utilise their powers in the most suitable way. And it is only necessary to see the things that patients are

taught to make, to realise how wonderful is the teaching given to-day in the best institutions for the feeble minded.

Under the Act the Board of Control have power [Section 25 (1) (f)] "to take such steps as may be necessary for ensuring suitable treatment of cases of mental deficiency." That gives the Board power to conduct scientific research, or to aid the conduct of such research, into the causes of mental deficiency, and into the possibilities of its prevention and cure. At the present day little is known; but research work is being carried on in various places in England and Scotland, and under this Act the Board of Control will be able to assist, and to co-ordinate, and to further the cause of research. The importance of the organisation and development of research work is great.

I will now sum up what seem to me the chief principles to be observed in the administration of the Act:—

1. The statutory bodies should utilise to the full all the voluntary institutions and societies, provided they are good.

2. Local initiative should be encouraged as much as possible, and local jealousy discouraged.

3. All regulations should be made elastic, so that our knowledge of methods of treatment may be improved by a variety of individual experience.

4. The need of co-ordinating effort for the sake both of efficiency and economy should be generally recognised, and local bodies, whether official or unofficial, should resolutely set their faces to prevent local jealousy interfering with harmonious national co-operation. As Mr. Deakin, the former Premier of the Australian Commonwealth, pithily put it: In order to make an Imperial omelette we must be willing to break many local eggs.

5. Mentally defective prisoners should not be treated as prisoners but as patients.

6. The interest of the individual patient must always come first.

P.S.—Since the above was written we have the news of the formation of a Provisional Committee to inaugurate the new Central Association for the Care of the Mentally Defective. If successfully formed I believe the new Association will increase the beneficial results of the Act to an incalculable degree.—L.S.

CONFERENCE III.—ENGINEERS AND SURVEYORS.

Presidential Address, by THOMAS MOULDING, M.Inst.C.E., City Engineer and Surveyor, Exeter (MEMBER), President of the Conference.

MEMBERS of our profession are busy members of the community, constantly working, in the office and out, for the welfare of the particular district of which they have charge, and incidentally, for the benefit of the whole community. Sometimes our work is not fully appreciated by the ratepayers; but, on the other hand, there are few works and improvements completed that do not prove that the criticisms passed during the preliminary stages are wrong. At the same time, criticisms, however unpleasant, are not unwholesome; and it behoves the engineer, especially in the municipal line, to heed what is being said about his work, to enable him to gauge the wants of the general ratepayer.

The requirements of the times are exacting; if a curve could be plotted showing the requirements of the public during, say, the last twenty-five years, it would show a very marked upward tendency, and the curve would be gradually getting steeper year after year.

Perhaps the standards as applied to:—1st, roadmaking; 2nd, housing; 3rd, sewage disposal, have been raised higher than the other branches of the work of a municipal engineer.

Roadmaking is perhaps the greatest source of complaint. There is considerable room for improvement if we are to cope successfully with the dust caused by the quick moving and heavy traffic using the highways. Various methods of treating the surfaces of roads have been tried; but all are more or less merely palliatives, and have no lasting benefit.

The remedy, I think, will eventually be found in some improved method of construction. Most of you would undertake to make a good strong, substantial road, with a smooth, even surface, a fairly long life, and nearly dustless as regards the wearing of the material, if cost had not to be considered.

Each district must be considered from its own standpoint as to suitable local stone, cost of imported stone, and essentially the class of traffic using the road.

I would say: don't use dirty flints if you can possibly avoid it.

I understand that the Road Board are willing to help any surveyor who will prevail upon his Council to allow him to carry out experiments in road-making, including both foundation and coating.

Housing.—This is also a source of much criticism. It is difficult to argue, even with one's self, that the purchasing of worn-out insanitary property, at often an enhanced value, for the purpose of effecting an improvement in the housing conditions of someone else, and, incidentally, the widening of a street one never uses, is going to do much good. The engineer knows that slum property has a bad effect on the death rate, and that the lower the death rate is reduced, the greater the longevity of life, and therefore the greater probability of good being done to the general benefit of the community by increasing the possible working life of many of its units.

The recent legislation regarding the housing of the poor has made it easier for local authorities to acquire property for the purpose of effecting housing improvements at a price more nearly approaching its true value. Every opportunity should be grasped by local authorities to wipe out slums, provide good substantial dwellings for the working classes at reasonable rents, and provide wide streets so as to give as much air as possible to those people who are perforce obliged to live their lives in towns.

The great drawback to providing cheap, well-built small cottages is, no doubt, the cost of building, and the inability of the builder to make what he considers a fair return on his outlay. The recent advance in prices of materials and labour indicate a continuance of this condition, and it therefore seems that the provision of workmen's cottages must necessarily be left in the hands of local authorities or co-operative societies.

When an authority clears any area for either a street improvement or housing improvement, it is well known that the Local Government Board compel the authority to provide a certain number of cottages for the dispossessed artizans, which must be let at a figure approximately the same as previously paid by the tenant on the area to be cleared, and very little consideration is given to the number of empty houses there may be in the town, unless they are well-built, and suitable from a rent point of view for the particular people dispossessed. The period allowed for repayment of sinking fund is usually sixty years in the case of buildings. To provide for this repayment of capital out of the rent inflates the rent beyond the pocket of the people for whom the houses are built. The Local Government Board meet this argument by saying the rent must be lowered to suit the tenant, and the loss on building, if any, must be borne by the particular improvement carried out. There is also the fact that when the sinking fund has been repaid, the financial loss on the houses, if any, might, and in all probability would, become a profit as the

rent in the first instance is always fixed on the whole cost of management, upkeep, repairs, interest, and sinking fund. The repairs being properly kept up, it is fairly reasonable to presume the property, at the end of the period of the loan, would be in a good condition, and have many years of life left.

Sewage Disposal.—This subject is probably the most important one in all towns, large or small, and is, therefore, a very necessary problem to solve. It is, perhaps, subject to more criticisms than any other municipal engineer's problem.

The criticisms take the following lines: It is too costly, too elaborate, too near someone's dwelling, the wrong system, etc., etc. As a result of the remarks of the critics the engineer decides on the most effective system, having regard to cost, position, and likelihood of nuisance.

Engineers to-day are in a much better position than their predecessors ever were. The Royal Commission on Sewage Disposal has, during the last fourteen years, gathered together a large amount of information from engineers who have carried out experiments, and the Commission has carried out some very useful experiments at various towns and under varying conditions throughout the country. As a result, we have the Fifth Report and, more recently, the Eighth Report: two very useful volumes indeed to the sewage engineer.

As you know, Exeter is the home of the septic tank; and, although the system is not exactly what it was first made out to be, you will agree that the country owes a great debt to my predecessor, Mr. Donald Cameron, for his patient industry and the hard work involved in carrying out his first experiments. The Exeter works were the first works constructed on a large scale, and perhaps the Local Government Board were not so strict at the time that powers to borrow were obtained as they are at the present time. My Council are now considering the advisability of bringing their works up to date, and to a better state of efficiency, on the lines of the Fifth Report.

These remarks could be extended in a degree to waterworks, tramways, sewers, and all other municipal engineering works. I will close my address by saying that I think all engineers, in whatever work they may be engaged upon, should aim at efficiency, having regard to the cost, but always at efficiency.

Notes on Town Planning, by John S. Brodie, M.Inst.C.E., Borough Engineer and Surveyor, Blackpool (Fellow).

THE Housing, Town Planning, etc., Act, 1909, has been in operation about three and a half years.

According to the information issued by the Local Government Board, the following results appear to show to what extent Part II. of the Act, Town Planning, has been operative:—

Schemes made and submitted to the Board for approval, 4; schemes authorised to be prepared, 30; applications to prepare schemes, 11; schemes under consideration, 120: total number of schemes, 165.

At first sight, it may appear that the beneficial results anticipated when the Act was passed have not been realised, but it must be evident that the many and varied interests involved in the simplest planning scheme require much time, earnest labour, tact and patience to bring it to a successful conclusion.

It is probable that many schemes will not yet have come under the notice of the Local Government Board, such as two schemes which we are maturing at Blackpool, which will, in all probability, go through by agreement, and without the machinery of the Town Planning Act.

It must, also, not be forgotten that the Act aims at improved housing conditions primarily, often necessitating extensive and costly demolition of congested central areas, which, however desirable in itself, is very properly the subject of careful and far-seeing consideration on economic grounds.

It is to be regretted that discussions at meetings in connection with town planning too frequently run in the direction of impracticable and visionary "garden cities"; whereas much more solid and rapid progress would be made if, instead of soaring too much into the realms of imagination, we kept on the firm ground of hygienic and economic facts.

I therefore suggest that the question be considered on practical lines such as the following, rather than deal with details as to road making, or the number of houses per acre:—

1. The importance of direct roads from central parts of districts to the outskirts, whether radial or rectangular. 2. The importance of wide main building lines (not less than 120 feet) rather than wide streets in such direct roads. 3. The importance of adapting any system of laying out roads to the natural configuration of the land, and consequently promoting good and economical sewerage. 4. The importance of making the plan capable of satisfactory expansion in the future into suburban areas. 5. The importance of constantly bearing in mind that the housing problem will certainly, in the near future, press more and more for solution on purely economic grounds, having regard to sound hygienic conditions.

Notes on the Applications of Reinforced Concrete, by G. B. R. Pimm, Assoc.M.Inst.C.E.

BUILDINGS. The advantages accruing from the use of reinforced concrete in building construction are most apparent in large structures, and may be summarised as follows:—

1. Its freedom from deterioration. 2. Its hygienic properties. 3. Its fire-resisting properties. 4. The absence of vibration. 5. The reduction of the load on foundations. 6. The saving of space.

The first four of these have been the subjects of much careful research, and a great deal of valuable information upon these points is available.

The reduction of the pressure on foundations is an important matter in buildings of all classes, particularly when considerable or unequal settlement is to be anticipated, unless efficient precautions are taken to guard against it. In such cases the adoption of a reinforced concrete raft presents a solution of the difficulty which is both simple and economical.

There is probably no branch of engineering in which the advantages of reinforced concrete are so apparent, and the scope for economical design, in the broader sense, is so great, as in the construction of retaining walls. The saving of material which can be effected is an important one, but in these days of crowded areas and high ground rents the economy of space will in many cases be the principal consideration.

Waterworks and Sewerage.—The uses to which reinforced concrete can be put in waterworks, sewerage, and hydraulic work generally include pipes, culverts, aqueducts, settling tanks, service reservoirs, filter-beds, elevated water-tanks, dams, etc. Water-mains, particularly those of considerable size, can usually be constructed more cheaply of reinforced concrete than of steel or cast-iron, the principal factors in this connection being the saving in railway rates and cartage, and in the labour entailed in handling heavy pipes.

In the case of culverts at a great depth, reinforced concrete admits of an economical design, and also offers facilities where special sections are required to meet the conditions of any particular case.

In tanks and reservoirs we have another illustration of the economy of space and the consequent reduction of overall dimensions effected by the use of thin walls instead of heavy gravity sections. There exists in the minds of many engineers a prejudice against the use of thin walls to resist water pressure, but a consideration of the conditions under which such walls usually act should dispel any doubts which may exist. Take the

case of a service reservoir with earth backing. It will probably be specified that the reservoir shall be tested before the filling is placed in position; in other words, that it shall be designed for full water pressure internally and for full earth pressure externally, either with or without a surcharge. Under ordinary working conditions we therefore have the earth pressure as an additional factor of safety when the reservoir is full, and this reserve of strength is even greater than appears at first sight. Now consider the reservoir empty with the earth backing in place. The external pressure produces a minute deflection inwards, and in accordance with the well-known laws of earth pressure, the internal pressure which must be applied to remove this deflection is considerably greater than the external pressure which produced it. It is, therefore, clear that under normal conditions, notwithstanding the excess of internal over external pressure, the stress in the walls will be considerably less than that due to the actual difference of pressure, and under favourable conditions may be practically negligible.

Bridges.—In small road bridges over streams, canals, or other roads, one of the principal difficulties is frequently to obtain a design which gives a sufficient waterway or headway without an excessive rise. That the headway has been obtained at the expense of the users of the road over the bridge is only too obvious in many of our country road bridges, and this must always be the case where the conditions are severe and a brick or masonry arch is constructed. In addition, the thrust of the arch involves the provision of massive abutments and foundations. Under such conditions a flat reinforced concrete bridge is an inexpensive form of construction entirely free from the disadvantages mentioned above.

In the case of existing arch bridges which have fallen into disrepair, it is an excellent plan to construct either a reinforced concrete lining or a saddle to relieve the structure of the whole of the weight, while at the same time the appearance is not in any way affected. The former method, *i.e.*, a lining formed under the existing arch, is theoretically the better, and should certainly be adopted if the bridge is very defective; but a saddle laid on the existing arch is, of course, far cheaper, and is in most cases quite satisfactory.

With regard to bridges of considerable size, there is in some quarters an unaccountable prejudice against reinforced concrete on the grounds of appearance, but it is surely no exaggeration to say that some of the most beautiful bridges in existence are of this material.

Maritime Works.—Works of this class include piers, wharves, breakwaters, groynes, sea-walls, and dams for reclamation and other purposes.

It is usually advisable to construct the various members or units of structures of this kind, as far as possible, in a depot near to the site, thus allowing them to mature under the most favourable conditions and confining the work on the site, where labour will probably be costly and inspection difficult, to fixing in position.

The many fine examples of the use of reinforced concrete in sea-defence works and maritime work generally, which are to be found in Holland, a country depending for its very existence upon the efficiency of these works, furnish ample evidence of the suitability of the material for works of this description.

Supervision.—It is a regrettable fact that in many cases in which reinforced concrete is employed, the importance of efficient supervision is underestimated. It may be remarked in passing that this applies also to other forms of construction, particularly mass concrete work and that the factor of safety is too frequently a factor for the absence of supervision.

Another important point to which insufficient attention is given is the position and manner of stopping concreting at the end of a day's work. In a floor slab, for instance, the proper way is of course to stop the concrete with a vertical face at the centre of a span. This is not, however, the obvious way, and it is invariably found that unless this point is insisted upon the concrete is stopped at a beam, probably because the stirrups and bars of the beam, projecting into the slab, form a kind of natural stopping place. It need hardly be said that for theoretical and practical reasons it is the worst place that could be chosen. The projecting steel acts as a kind of filter, allowing the finer constituents of the concrete to pass through, holding back the larger aggregate, and leaving porous concrete to resist the compressive stress in the top of the beam and the diagonal compression in the slab, both of which are at a maximum at this point.

Methods of Construction.—There are many portions of reinforced concrete structures which may be either constructed *in situ* or moulded beforehand at a depot, and the question of deciding which method shall be adopted in any particular case repays very careful consideration. Of course, if the latter method is adopted, the members must be suitably designed, as it is possible that the stresses produced during handling may be entirely different from those which will exist in the finished structure. There are some members, *e.g.*, roof trusses, in which there can be no doubt that more satisfactory work can be obtained at a smaller cost by moulding beforehand, and in other cases where the *in situ* method is generally practiced, the writer is of the opinion that considerable economies could

be effected if the work *in situ* were confined to fixing, even though, as stated above, the members have to be specially designed and strengthened, though this would not always be necessary.

Regulations.—The more one realises the adaptability of reinforced concrete and the varying conditions which must be taken into account, the more one is convinced of the futility of laying down hard and fast rules to govern its design. It is, of course, a fundamental principle of design to allow for the worst possible conditions in a particular case, but a regulation must go a step further to meet *any* case, and will, therefore, operate harshly when the conditions are favourable. For this reason it is desirable that regulations should be quite general in character. In the matter of specifying the bending moments to be assumed for example, all that can be done by specific regulations is to tie the hands of the designer in a few very simple cases, leaving the solution to all the more complex problems entirely to his discretion.

In the drafting and framing of by-laws applying to reinforced concrete construction it is to be earnestly hoped that every effort will be put forth to avoid the inclusion of such clauses as would unduly limit its application.

Marine Baths, with special reference to the proposed Medical Baths at Torquay, by Henry A. Garrett, Assoc.M.Inst.C.E., Borough Engineer and Surveyor, Torquay (member).

THE subject of this paper falls more to the lot of a physician than to that of a municipal engineer. It is one of such interest to the public, that, if better understood, it should lead to an improved state of health of the people generally.

Every health resort in this country with an eye to its own special attractions and natural opportunities must make the most of these attractions if they are to retain their popularity, and municipal engineers are a body of men deeply concerned in the development of all matters which have for their object the improvement and maintenance of the public health, especially in the districts they represent.

Bathing may be considered from a two-fold point of view, either as a means of purifying the surface of the body or as a method of cure in certain diseases. Medical researches tell us that cold or tepid water (either sea water or fresh water) by the addition of various mineral compositions and methods of application increase their wholesome effects to such an extent that many diseases may be alienated or terminated.

Yet how little has the use of the bath been adopted in reference to this end, especially amongst English people. Our varying climate may have something to do with the fact that bathing cannot be so freely indulged in as is the practice in eastern nations, where the heat renders perspiration copious and frequent bathings necessary duties of life, and who therefore exalt ablution and bathing to the rank of a religious observance.

It is true that the shores of our island during the summer months are covered with crowds of all classes who repair thither not merely for the purposes of benefiting from the medicinal qualities found in the sea water but chiefly as a source of pleasurable sensation. This indulgence is limited to a very few summer months of the year, and then it is that visitors to our English seaside health resorts frequently enquire for the scientific bath treatments so lavishly afforded in many continental health resorts and spas, and in their absence seek abroad what might in so many instances be afforded them in their own town. Is it not a fact that every seaside town is a spa? The sea, the general name given to the vast body of water which forms the superficial covering of nearly three-fourths of the globe, is rich in saline qualities. Its saltness and bitterness is due to the presence in it of various saline ingredients of which

chloride of sodium is by far the largest, and chemists tell us that as a mineral water it has extraordinary health-giving virtues. To bathe off the English coast we are told is essentially the same thing, from a cure point of view, as to do so in some of the medical baths of great continental health resorts.

Public medical baths are common in Europe, there being few cities without most extensive and attractive installations. The subject is one which has until very recently been greatly overlooked in our own country, but it has begun to be better appreciated and to receive something like a due share of attention. Our neighbours across the channel consider the subject to be one of their first resources of healthfulness, and make the most of them to the disadvantage of our English health resorts. Hence it is that so many of the latter are during the winter months depleted of their visiting population and suffer loss accordingly.

It is a gratifying feature of our own towns that the care for the health and comfort of the poorer classes has taken a deep root amongst sanitarians, and the erection of public baths is a matter in which municipalities are taking a lively interest. The Baths and Washhouses Act has enabled many large establishments to be opened in which private baths, both hot and cold, and also swimming baths, can be enjoyed at a very low charge, and where, in another department, the wives and daughters of the poorer classes are allowed to wash and dry and iron their linen, and with the conveniences and accommodation that are not possible for them to get in their own homes.

Contemporaneously with this increased attention to means of bathing for the poorer classes, there has been a greater desire for accommodation for those who can afford it, and a desire for developing on scientific lines the advantages to be obtained from not only mineral springs, but from sea water also. Hence the author's special reference to the proposed installation of medical baths by the Corporation of Torquay. Sea baths, both hot and cold, have, it is true, been in existence at Torquay for many years, but these in no way meet modern requirements, and therefore it is not surprising that their complete reconstruction has been determined. It does not follow that the existence of a mineral spring is essential to the methods of treatment. There are many valuable treatments which can be developed from the use of sea water, and which the medical profession now favour. These treatments can be as efficaciously carried out at Torquay as anywhere in the kingdom: indeed, the presence of an unlimited tidal water surrounding the building which, as ordinary baths, has existed so many years, gives the scheme an enormous and unusual

advantage at the start. Realising these facts, and possessing the beautiful site of the existing bath saloons, supported by the medical profession, and also having secured the services of an eminent bath expert as architect, led the Corporation to embark upon the construction of a complete system of medical baths and a swimming bath, which with the most attractive covered promenade on the front, commanding the finest views of Torbay, give it a charm which may be said to be almost unique. The Corporation had, of course, to seek Parliamentary powers. A Provisional Order was duly obtained, extending the powers already conferred upon them by their Harbour Act, and now it only remains to obtain the sanction of the Local Government Board to the proposed expenditure of £15,000 to carry out the work immediately.

The installation will include the hot-air treatment in various forms, Aix and Vichy and other douches, light and heat baths, and the deep and special reclining baths. Every bath will be provided with two dressing rooms, and separate wings are to be set apart for ladies and gentlemen so that a continuous round of baths may be given to both sexes. For the comfort of visitors the smaller bath saloon, hitherto known as the ball room, is to be converted into a lounge, reading room, and cooling-off room. It will be connected direct to the outside covered promenade overlooking Torbay.

It is also hoped to make a special feature of the seaweed bath. The shores of Torbay provide in abundance a species of *fucaceæ*, a seaweed belonging to the tribe of *sargassum*, and commonly known as sea-wrack. Its roots form a conical disc which adhere to the rocks. It has branching fronds, olive brown or olive green colour, of a tough leathery substance, and covered with bladdery swellings. Gathered at low water, boiled down and used in the same manner as in an ordinary peat or mud bath, it has been found to be exceedingly beneficial in cases of rheumatic and other similar ailments.

Realising that no baths would be complete without a swimming bath, it has been determined to construct one in conjunction, but separate from the medical baths. The bath will have a water area of 90 feet by 35 feet wide, with forty-six dressing boxes and promenade gallery over.

In addition to the educational advantages of such a building, it will be an entertainment as well as a cure. Educational from the point of view that it should enable swimming, and especially life saving from drowning, to be included in the curriculum of our elementary schools. Entertaining in that it will afford a pleasant rendezvous for those who enjoy a good swim, and will encourage feats of competition during a season when open-air bathing is not possible, and a cure in that it is one of the

most important branches of gymnastics. Its effect in developing, invigorating, and giving health to the body are as great as the physical training under what is known as the Swedish system, now so freely adopted as part of our military system of training. It is surprising to find how little the art of swimming is practised even at our seaside resorts, and this is due in a great measure to the fact that the beginner cannot be persuaded that the water will support him; hence, a swimming bath of tepid sea water, emptied and filled daily, available all the year round, should prove a valuable asset to the installation.

Separate days will be set apart for ladies, and special hours for use by both sexes in our elementary schools.

The chief of the difficulties which will have to be faced, will be the selection of materials for the construction of the baths and bath rooms. The best material of course is marble in the form of slabs, but this is expensive. Various kinds of tiles have been used in the existing baths, but the action of the steam from the hot sea water has in a very short time destroyed these. A special vitreous tile, which is undergoing tests, will be used if found satisfactory. Sea water when raised to a high temperature leaves a considerable deposit of salt, and trouble might be experienced in the circulating system. The hot sea water will require to be carried to the mixing boxes in the douche rooms, and experiments are now being made with a view to introducing the most satisfactory system of distribution.

The subject is one of wide possibilities in our seaside resorts, and should be taken up more extensively by the municipalities. Many will argue that it should be left to private enterprise to promote such schemes, in fact private enterprise has in many instances done so, chiefly in connection with the large palatial hotels and hydropathic establishments in our great cities and some of our larger provincial towns; but generally these installations are beyond the reach of the general public, and therefore, where possible, municipalities should be given power to promote such schemes which can have but one effect, the improvement of health and physical development of the people.

Since the above paper was written a tender for the new Baths in the sum of £14,942 has been accepted by the Torquay Corporation, and it is hoped the Installation will be ready for opening by the Spring of 1915.

OBITUARIES.

Sir William H. Preece, K.C.B.

The Council deeply regret to have to record the death, on the 6th November, of Sir William H. Preece, one of the Vice-Presidents of this Institute and a distinguished Electrical Engineer. He was born at Carnarvon in February, 1834, and was educated at King's College, London. In 1853, he entered the service of the Electric and International Telegraph Company, and three years later became Superintendent of the Company's southern division. Upon the transfer of the Telegraphs to the Post Office in 1870, Preece went over with them and became a Divisional Engineer; subsequently, in 1877, Electrician, and succeeded to the post of Engineer-in-Chief in 1892. Upon his retirement in 1899, having reached the age limit, he was appointed Consulting Engineer. In recognition of his services he had been made a C.B. in 1894, and in 1899 was created a K.C.B.

Upon retirement he commenced practice as Consulting Electrical Engineer in conjunction with Major Cardew and two sons, their services being much sought after.

He carried out a considerable amount of scientific research in connection with Electricity, Telegraphy, and Telephony, and wrote several books in connection with these subjects. He was an energetic worker, and contributed largely to the introduction of the Telephone and Wireless Telegraphy, having been a pioneer in the latter field.

He was a very able and interesting lecturer and a Fellow of the Royal and many other scientific Societies, and was President of the Institution of Civil Engineers in 1898, twice President of the Institution of Electrical Engineers, and Chairman of the Society of Arts in 1901. He was elected Member of The Royal Sanitary Institute in 1899, became Fellow and Vice-President in 1901, and was President of the Institute Congress in 1899 at Southampton.

Sir William Preece was a widower, and left four sons and three daughters.

H. T.

Mr. William Hunting, F.R.C.V.S.

It is with deep regret that we have to announce the death of Mr. William Hunting, F.R.C.V.S. He was a valued member of the Veterinary profession, which owes so much to his unselfish devotion to its interests and to the professional advance of its members.

It is chiefly as a Member of the Board of Examiners of The Royal

Sanitary Institute that we desire to place on record the great assistance he was ever ready to give us in furthering the educational side of the Institute's work. As a lecturer he was exceptionally at home; his demonstrations were clothed in simple and concise language, such as one would expect from one whose literary attainments were above the average, and who worked with a whole-hearted desire to instruct those under his tuition.

As a colleague on the Board of Examiners, his sound professional knowledge and his clear judgment were from the first fully recognised. His genial manner and his personality made him one of its most useful members, and his devotion to the interests of his profession was of the greatest value to those who for many years were associated with him.

His death is indeed a loss to us all, as we realise that the Institute owes much to the care and advice Mr. Hunting ungrudgingly gave us at all times, and especially when the examinations were in the early stages of development.

He was elected Member of The Royal Sanitary Institute in 1899, and the same year joined the Board of Examiners. In 1903, he was unanimously elected a Fellow. J. L. N.

HENRY FRANKLIN PARSONS, M.D.Lond.

Two years ago Dr. Parsons retired from the post of Assistant Medical Officer of the Local Government Board, with which he had been connected first as Medical Inspector and subsequently as Assistant Medical Officer since 1879.

Dr. Parsons was the author of very numerous reports to the Local Government Board on Public Health subjects, of which, perhaps, the best known are his two reports on the Influenza Epidemic of 1889–92, and his report on Isolation Hospitals of recent date. Dr. Parsons was a Fellow of the Geological Society, and for two years President of the Epidemiological Society. He was elected a Member of The Sanitary Institute in 1888, and a Fellow in 1904.

Dr. Parsons' energies were almost entirely devoted to the work of his Department at the Local Government Board, where his encyclopædic knowledge on all subjects connected with Public Health and Sanitary administration, no less than his unfailing good nature, generosity, and helpfulness, were most warmly appreciated. It is very much to be regretted that a life devoted so whole-heartedly to the best interests of his country should have failed to secure for Parsons any recognition from the State of the value of services so ungrudgingly given. L. C. P.

NOTES ON LEGISLATION AND LAW CASES.

These notes are copied by permission from The Law Reports published by The Incorporated Council of Law Reporting for England and Wales.

For full text of these see Law Reports, which can be referred to in the Library of the Institute.

ADULTERATION.—*Sale of Food and Drugs Act, 1875 (38 & 39 Vict., c. 63), s. 25—Milk—Written Warranty.*

The appellant, being charged under the Sale of Food and Drugs Acts with selling milk that was not of the nature, substance, and quality of the article demanded by the purchaser, proved that the milk had been bought by him from a company under a written agreement, and had been sold by him in the same state as when it was purchased.

The agreement provided that "the company hereby warrants each and every consignment of milk delivered under this contract to be pure genuine new milk, with all its cream, according to the conditions of the Food and Drugs Act," and that "no responsibility is taken by the company after delivery other than under the Food and Drugs Act," and that for all other purposes the buyer must satisfy himself at the time of delivery that the milk was pure, and that he should not be entitled to make any claim against the company for damages in respect of milk accepted by him :—

Held, that the agreement constituted a good warranty within s. 25 of the Sale of Food and Drugs Act, 1875, and that the appellant was, therefore, entitled to be discharged from the prosecution.

Wilson v. Playle (1903) 88 L.T. 554, followed.

PLOWRIGHT v. BURRELL. Div. Ct. 362. K.B. Vol. II. July, 1913.

RAG FLOCK.—*Standard of Cleanliness—Making an Article of Bedding—Re-stuffing or Re-making a Mattress—Rag Flock Act, 1911 (1 & 2 Geo. 5, c. 52), s. 1, sub-s. 1.*

By s. 1, sub-s. 1, of the Rag Flock Act, 1911, it shall not be lawful for any person to use for the purpose of making an article of upholstery, cushions, or bedding flock manufactured from rags, or to have in his possession flock manufactured from rags, intended to be used for any such purpose unless the flock conforms to the prescribed standard of cleanliness. If any person uses or has in his possession any flock in contravention of the Act he is liable on summary conviction to a fine :—

Held, that the words "making any article or bedding" do not include the process of taking the flock out of the covering of a mattress and refilling the covering with the same and no other flock.

GAMBLE v. JORDAN. K.B. Vol. III., Part IX. September, 1913, 149.

Volume XXXIV. No. 12. Issued January, 1914.

JOURNAL

OF

THE ROYAL SANITARY INSTITUTE

CONGRESS AT EXETER.

CONFERENCE I.—MUNICIPAL REPRESENTATIVES.

Address, by THE RIGHT WORSHIPFUL THE MAYOR OF EXETER, (H. W. MICHELMORE, ESQ.), President of the Conference.

TO-DAY I have the honour to greet you as a Freeman of the City of London, and also as Mayor of the City and County of the City of Exeter, the two oldest cities in the land. Possibly Winchester and York may not be disposed to admit my claim, but I am convinced that neither can prove it wrong. London and Exeter have had much in common in the past; both date the commencement of their mayoralties from the year 1200; their arms are remarkably similar, and are the only city arms which had a crest and supporters prior to the reign of Queen Elizabeth; both have mottoes, that of Exeter, "*semper fidelis*" (ever faithful), was bestowed by Queen Elizabeth in recognition of the city's services in fitting out three ships to fight the Spanish Armada, that of London, "*Domine, dirige nos*" (O Lord, direct us), was adopted by the city in 1633. Such were the ideals of our great ancestors. To-day, the councillor, whether of city or county, has a greater sphere of influence and usefulness than the ordinary Member of Parliament, and yet from a variety of reasons, those who by virtue of their education, leisure, business training or strong personality would and should be the most valuable members in the public service, stand aside in greater numbers and decline to serve. As a result, matters most important and far reaching affecting the public weal are relegated to others less qualified, with results which would be more disastrous if there had not at the same time arisen, in the place of the older men, who in comparison

were more or less amateurs, a class of able experts who form the policy and skilfully guide the decisions of these great bodies, the business of which is in reality done by fewer and fewer individuals.

There are no coveted letters to be gained as in the navy and the army by serving the country on a council. On the contrary, this entails a considerable sacrifice of time, and in the counties, of money as well, and what is a greater terror to many, the publicity of the Press. This being so, shall the public service be ever increasingly starved and neglected by those whom we desire to see interested therein? Can nothing be done to raise it to a higher plane, and to bring home to the individual the fact that he owes to his city or county a loyal service as a debt of honour, or rather that this service is not merely a duty but a privilege, whereby the individual has unique opportunities of personal development? For why should men have a keener sense of their rights against the community, than of the rights of the community against them, seeing that in truth they are mutual? Good citizens will recognize that what is primarily another's, demands and deserves their care and protection as well as that which they call their own. It may be that the first instinct of the individual citizen is to assume that his influence is so small, as a mere unit in the city or county, that, for instance, the sanitary conditions of the community cannot be in any way affected by his views; but if we look more deeply into things, it becomes evident that the sound produced by the full orchestra is composed of the notes given forth by each separate instrument. Just as one instrument playing out of tune spoils the harmony of the whole, so the dignity and honour of our councils are at the mercy of the individual members, and since it is so much more easy to destroy than to create public confidence, it is of the greatest importance that those whose principles are lax, whose tastes are low, or whose ways are crooked, or dictated by self-interest, should not be accorded a seat amongst us, and it is equally detrimental to admit the representative of a selfish class or trade. One crooked action by a council shakes the public confidence, and its power for good, which has been the slow and gradual growth of years, is shattered for a considerable period.

Seeing then that the capacity and utility of a council depends on the intellect and integrity of its individual members, it is imperative that those chosen to rule should be enlightened, and possess a single eye for the good of their city or county. Those who have studied their Plato, will recollect how in his "Crito," he shows that a man owes his opportunities and privileges to the State, which is essential to his life. Now, the cities and counties are needing the services of the best, who will combat the

assertion of class rights, lay themselves out to remedy wrongs, explain away those which are imaginary, and take the trouble to educate public opinion. What is keeping men back? Is it not, to put it shortly, selfishness, in place of which we require a fresh effusion of the spirit which actuated those fine men of old, who did so much to lay the foundation of our great Empire, and who adopted as their motto, under which all the work for their great municipality was performed, "*Domine, dirige nos*"? The result would then be that expressed on the banner under which we are now met, "*semper fidelis*," which expresses something far more than allegiance to sovereigns of various views and claims, in the spirit of the Vicar of Bray, namely, "Fidelity to the spirit of true government," which should be the ambition of every true citizen. Is it too much to appeal to each of you, who are the leaders of municipal life and thought throughout our land, to exercise your undoubted great influence in order that this spirit may ever dominate your own locality; for I am so bold as to assert that if you take back from this Congress no inspiration other than this, those who sent you as their representative will have no reason to regret their delegation, nor will you ever begrudge the time you have devoted to visiting "*semper fidelis*," the Queen of the West.

* The Financial Aspect of the Housing of the Working Classes.

Report compiled by HENRY R. ALDRIDGE, Secretary, National Housing and Town Planning Council.

THE Housing and Town Planning Act of 1909 contained provisions giving the Local Government Board power to make regulations for the systematic inspection of houses in each district, and this inspection, which is declared to be a primary duty of the local authority, has to be made with a view to ascertaining whether any dwelling house is in a condition so dangerous or injurious to health as to be unfit for human habitation.

The regulations issued by the Local Government Board require, amongst other things, that local authorities shall make definite arrangements for the following:—

1. A thorough inspection to be carried out from time to time according to the varying needs of the dwelling houses in their districts.

2. The keeping of records as to the condition of each house inspected in regard to specified matters which may affect the health of the inhabitants.

3. The inclusion in each medical officer's yearly report of a statement of the work of inspection and the action taken in regard to the house found to be unsatisfactory.

These requirements as to inspection have revealed a very serious state of things as regards the condition of working-class houses throughout the kingdom. Last year no fewer than 46,487 houses were represented as unfit for habitation. This number represents, however, only a small percentage of the real number of houses unfit for habitation. Medical officers are loth to take action when they know that if houses are condemned the families living in them have nowhere else to go to. The shortage of suitable houses for the poor, in town and country alike, affects vitally, therefore, the administration of closing powers.

In the Insurance Act of 1911, clause 63 provides that, if the Insurance Commissioners or any approved society finds that excessive sickness has occurred from various causes, of which bad housing conditions is one, they may appeal to the Local Government Board for an enquiry, and if the person holding the enquiry considers there has been neglect on the part of the local authority, he may award a certain sum of money to be paid

* Compiled from a Report prepared by Mr. Harold Shawcross (Chairman of the Executive Committee of the National Housing and Town Planning Council). A Memorandum on the Housing of the Poorest. A Paper on the Working of the Irish Labourers Acts. Published by the National Housing and Town Planning Council.

by the local authority, to compensate the committees or societies for the sums paid on account of such excessive sickness.

Whether this power is of any value or not is doubtful, but, at any rate, the fact that such a clause has been passed by Parliament emphasises yet again the grave responsibility falling on local authorities.

Moreover, under the Insurance Act the Government, through the rates, taxes and contributions from employers and employees, are proposing that local authorities should spend something like £2,000,000 a year for the treatment of consumptives in dispensaries, hospitals and sanatoria.

It is extremely questionable whether this is a wise expenditure or not. It is admitted by all authorities that housing and environment are almost the most potent factors in spreading consumption, and unless the home conditions of patients suffering from this disease are considered and improved, very little good will be effected.

It is the height of folly to take patients from undesirable homes, away for a few months to sanatoria at a very great expense (25s. to 40s.) and then to dump them down again in their old homes and under their old conditions; and yet this is what is being done in many cases. It is impossible to do otherwise in most places, owing to the great scarcity of houses.

Would it not do far more good if some of this money was spent in providing suitable homes for the people suffering from, or liable to, this disease? For every person suffering from consumption, there are generally found three or four cases of contacts, members of the patient's family or persons living in the same house, who have either got the germs of the disease or are susceptible to it. These should all be placed in better environment if their home is insanitary, and far more good would be done in spending some of this money in providing sanitary homes for such people in pure air, and where they could be under some kind of control, than in sending patients to sanatoria at enormous expense and with no provision made for their after life. For the cost of one patient in a sanatorium, five or six families could be housed in sanitary homes.

In regard to the general question of housing supply, it is admitted that private enterprise is failing to build houses in sufficient numbers to provide for the increase of the labouring class population, or to replace those houses which ought to be condemned as unfit for human habitation. Nowhere is this shortage more acute than in the manufacturing towns of Lancashire, and in most of these nothing can be done towards the clearance of slums, or the dealing with back-to-back houses, because there is nowhere for the people to go if houses are closed.

The town and country problems to be faced are, however, somewhat different, and will require different treatment.

In the country districts the difficulty is mainly one of low wages, and though most will admit that the rural labourer ought to receive a sufficient wage to enable him to pay the rent of a proper house, yet the provision of the latter is so imperative in the country, where a greater proportion of the houses are obsolete or in an insanitary condition, than is the case in the towns, that we cannot wait until the better wage has been secured. This will inevitably take some time. Nor will there be any guarantee even if wages can be raised at once that new houses will be built in the absence of a well-equipped building industry and adequate capital, and that part of the extra wages will be spent on a sanitary house.

In the towns the problem is complicated by the slum areas with which most are burdened, and though some of the inhabitants of these are unable to pay an economic rent for a sanitary house, yet many families living in slums are well able to do this, having enough money coming weekly to live in comfort in a decent home. Their income is often so improvidently spent that they appear always to be in want. These form a very undesirable class in our towns, and the provision of houses for them is one we shall have to face. There are two ways in which the problem can be dealt with.

The first is for the local authority to build houses for the better-paid artisans or operatives, or to stimulate the building of such houses by buying land in large quantities, laying out the same on garden city lines, or under a town plan, and offering the land in a developed state to builders, to private persons, or to public utility societies at a ground rent which will cover the cost of the land, and also the cost of all sewering and street works. Such houses would have to be built under such conditions for securing amenity and comfort as the local authority would prescribe.

This would seem to be the most natural plan to follow, as, if sufficient houses were built under this procedure, there would be a general move up, and the authority would then be able to close the worst houses.

The disadvantage of the procedure is that under it we only shift the slum dwellers into slightly better houses and areas, which they will, in many cases, proceed to make nearly as bad as those from which they have come. There is at present a constant fear on the part of landlords owning blocks of houses, who are anxious to keep decent tenants in them lest they may get in undesirable ones, who will cause the others to leave and so let the character of the houses down.

Also, by the above method of providing houses, we do not meet the very grave question as to how the housing needs of the man with a large family are to be met. As is well known, landlords often refuse to have

such tenants, and it is quite time that something was done to provide such families with large enough houses to accommodate them decently.

The other way in which local authorities can proceed in solving this question of shortage of houses is by starting at the other end, and instead of building or getting houses built for the best-paid workmen, to begin at the bottom and build for the poorest.

In support of this it may very reasonably be urged that better class working men can, through societies or unions, easily secure that houses shall be built in sufficent numbers where needed. The organisation of the operative class is now so complete through trade unions and co-operative societies, that even if it is impossible for the individual working man to build or to buy his house, it can easily be done through societies of one kind or another. Therefore the argument frequently used by members of local authorities, that the building of houses for skilled workmen should be left to private or co-operative enterprise, and that municipalities should not embark upon it, has much reason in it.

Instead, therefore, of building for the best-paid working man, the local authority may decide to build for the poorest, and to confine its operations to housing those actually turned out of houses that are condemned or overcrowded.

In building on these lines Liverpool gives almost the only example of what can be done. This city has promoted several schemes under Parts I. or II. of the 1890 Housing Act, by buying up certain areas of slum property, compensating owners, and erecting dwellings on the cleared sites.

The results upon the people rehoused in these houses has been very satisfactory, for we find tenants living in these dwellings who have previously lived in the slum dwellings now destroyed. No one is allowed to rent a dwelling in the Liverpool tenements lately erected unless he or she has lived in a house that has been condemned or that is marked out for that fate. It has therefore been possible to estimate the effect upon the same families of the changed sanitary conditions under which they are now living. The result has been exceedingly good, and we are told by the officials who have to look after these tenements that little by little the tenants respond to their better environment, begin to take a pride in their houses, and gradually learn to live better lives. It is doubtless hard to change the habits of some older people who have become inured to slum environment through a life-long acquaintance with it, but at any rate great good should be done to the children, who respond readily to the improved conditions. It seems hardly conceivable that children reared in these tenements should ever go back to their old slum conditions.

From 1864 to the end of last year the city of Liverpool had spent £1,135,000 on the demolition of insanitary property and rebuilding, the net charge to the ratepayer on the whole outlay being £37,000 per annum, but the cost of the special policy of housing the same people is £22,700 per annum, a matter of 1¼d. in the £ on the rates. As Liverpool spends £200,000 a year on museums, parks, libraries, baths and hospitals, £22,000 a year is not too much to spend in saving human life by means of improving the environment of the people. Of this £22,000, nine thousand represents the sinking fund by which the property is paid for, and which property will become a most valuable corporate estate in years to come.

The result of this policy is that Liverpool has to-day 2,174 dwellings containing a population of 8,000 odd people, everyone of whom has been turned out of an insanitary house, a cellar, or an overcrowded house, and it is chiefly because they charge rents approximating to what these people paid before they were turned out that the Corporation is losing £22,000 per annum.

Those who have studied the effect of the Liverpool Housing Schemes upon the health and morale of the people rehoused from insanitary areas will admit that the Liverpool Housing Committee can fairly claim that however much the cost may seem in money yet the experiment has been more than justified by the results.

In view of the fact that the rehousing of the poorest has never been effected by local authorities except at a loss, it will be difficult to persuade local authorities to place more burdens on the rates for this purpose; and since we are now embarked upon actual schemes of social reform financed largely by the State, it seems a fitting and reasonable thing to ask that in this matter of the rehousing of the poorest there should also be some assistance from this source.

Local rates have been so much increased of late by expenditure that is considered by most people to be of a national character that there will be a strong disinclination amongst municipalities to add to their already high rates unless some substantial help is given by the State.

Memorandum on the Housing of the Poorest.

The following proposals for legislation (based upon the legislation embodied in the Irish Labourers Acts, modified to suit British conditions, and extended to suit the needs of towns) are made for the purpose of housing: (1) Agricultural labourers in Great Britain whose wages do not enable them to pay an economic rent; and (2) The poorest poor of our towns who are at present living in insanitary dwellings.

Controlling Authority.

A department of the Government or of the Local Government Board specially to deal with the housing of the working classes. It would have the condemnation of old houses and the provision of new ones under its charge. (It is not suggested that town planning should be included in the work of this department.)

It is essential that this new department should have, through its inspectors, the power to carry out schemes for rehousing labourers in rural districts, and schemes for dealing with insanitary areas in towns in cases where the local authority refuses to act, with power to charge any loss to that authority.

Financial Proposals.

Financial help should be given in either of the following ways:—(1) Granting loans at 2½ per cent. interest (Post Office depositors rate) to local authorities; (2) Allowing local authorities to borrow money, as at present, through the Public Works Loan Commissioners, and granting to them a yearly subsidy of the difference between 2½ per cent. and the rate of interest paid by them for the loan.

Different provisions will be necessary for rural districts and for urban areas.

PROPOSALS RELATIVE TO THE HOUSING OF THE POOREST IN RURAL DISTRICTS.

Administrative Authority.

The Rural District Council.

Persons to be Benefited.

Agricultural labourers in receipt of not more than 3s. per day, who: (1) Are at present living in insanitary cottages; (2) Are unable to find suitable cottages in the district in which they are *bonâ fide* employed; (3) Have not allotments with their present cottages.

No domestic servant should be eligible. The claims of a man with a large family of young children should be considered first, and in such cases it might be necessary to waive the income limit above mentioned.

How Administration is to be Secured.

By representation of three persons to the district council, who must be either labourers living in insanitary cottages, or ratepayers of the rural district or of the county in which the rural district is situated.

The form of representation might follow that of the Irish Acts.

Acquisition of Land.

Land should be acquired either by agreement or compulsorily, and, if the latter method is used, the local authority should have the power of acquiring land on the valuations which are made under the Finance Act of 1909.

A garden or allotment not exceeding one acre should be attached to each cottage. In most cases one half acre will be enough, but that where possible labourers should be allowed to have more land than this upon paying an extra rent for it. In some cases the allotment may have to be at a distance from the cottage. Convenience of the cottage for the tenant's work, or of the water supply or re-building on old sites may make this necessary. Land may be wanted sometimes for existing cottages. In this case the same procedure should be adopted.

No stamp duty should be required in purchasing land.

Selection of Sites.

The points to be considered should follow the lines of the Irish Act: (*a*) Good land, (*b*) Easy access and drainage, (*c*) Good aspect for cottage towards south or east, (*d*) Convenience of water supply, (*e*) Economy in fencing, (*f*) Minimum drainage to owner and occupier.

The scheme should not interfere with residences, home farms, or demesne lands.

Cottage Requirements.

Plans for cottages should be issued by the Department, and local authorities should be allowed to build to these plans even if they do not conform to their own bye-laws.

If other plans are used they should be approved by the Department.

The Local Government Board should be empowered to relax the provisions of local bye-laws as regards streets, roads and sewering, where these can safely be done in carrying out a scheme.

In all cases, cottages should be provided with three bedrooms.

Conditions of Tenancy.

Cottages should be let from month to month, but wherever possible rents should be collected weekly.

Rents of Cottages.

The rents of cottages should be fixed to cover the net annual amount of interest on total outlay, calculated at 2½ per cent. per annum, plus an additional charge to cover the cost of repairs, insurance and collection, but not sinking fund.

The sinking fund should be a charge upon the rates of the district and there should be power given to the local authority to charge this upon parishes benefitted by the scheme, subject to the approval of the Local Government Board.

The rents charged should be subject to the approval of the Local Government Board.

Re-consideration of Terms of Subsidy and Revision of Rents.

Power should be reserved by the Local Government Board to consider the amounts paid as subsidy from time to time, as, owing to changing conditions, the same amounts may not be required in the future. There should, however, be no re-consideration until the expiration of ten years. The local authority should have power to charge increased rents upon a change of tenant, where the house was no longer required for the housing of families turned out of insanitary property.

PROPOSALS RELATIVE TO THE HOUSING OF THE POOREST IN URBAN DISTRICTS.

Administrative Authority.

The Urban District Council, the Borough, or County Borough.

Financial Proposals.

It is suggested that money should be lent to local authorities who are carrying out schemes at 2½ per cent., for constructive purposes only, for dealing with insanitary areas in their districts, or for the housing of the poorest; or, alternatively, that if the authority borrows in the usual way, grants should be made of the difference between 2½ per cent. and the amount at which they borrow.

It is not recommended that any grants should be made towards the purchase of insanitary property, but that annual grants in aid should be given by the State to local authorities :—

1. For purchasing land and building houses for the people turned out of houses condemned under Part I. or Part II. of the Housing Acts of 1890, as amended by the Act of 1909, in cases where those dispossessed are unable to find other houses owing to: (*a*) The scarcity of houses, (*b*) Their inability to pay an economic rent, (*c*) The refusal of landlords to let them houses owing to the prejudice against letting good houses to persons turned out of insanitary property, (*d*) The refusal of landlords to let houses to tenants who have large families.

2. For buying land from which insanitary property has been cleared; such land to be kept by the local authority unbuilt upon and used for playgrounds, open spaces, recreation grounds, or gardens.

Rents of Houses for the Poorest.

It is proposed that the rents of above houses should be based upon the capital expenditure upon the house, plus expenditure on roads, sewers, land, etc., calculated at 2½ per cent. upon the cost. To this must be added the cost of repairs, insurance, painting, decorating, and collection; also a sum for rates, taxes, and water charges.

The sinking fund should generally be a charge upon the rates, but in some cases it might be charged to the tenants. This should be left to the local authority to arrange in any scheme submitted.

The rents charged should be subject to the approval of the Local Government Board.

Summary of the Labourers (Ireland) Acts.

These Acts have been passed in the period extending from 1883 to 1906, and both Unionist and Liberal Governments have been responsible for placing them on the Statute Book and for their administration.

The Administrative Authority.

The Acts apply to Rural Districts only, and are put in force by the Councils of these districts.

The object is to better the condition of agricultural labourers by providing them with suitable dwellings and allotments.

An agricultural labourer is defined as a man or woman who does agricultural work on land at any season of the year for hire to some other person. It may include hand-loom weavers or fishermen who work on land at some season or other. Their average wage must not exceed 2s. 6d. per day. No domestic or menial servant is eligible.

A Rural District Council may charge rates up to a total of 1s. in the £ to make up losses on housing: in some cases up to 1s. 3d.

How the Administration of these Powers is Secured.

The Acts are put in operation by "representation" from three persons, each of whom must be a ratepayer or an agricultural labourer. If the District Council refuses to act, the Irish Local Government Board may take action in default. The Board has done so in several cases.

Reasons for Representation.

Where there are not enough houses for accommodation of labourers.

Where labourers are living in houses unfit for habitation.

Where additional allotments are desired, either for cottages provided by the Acts or for cottages owned privately.

Where it is suggested that existing houses should be acquired and enlarged.

Where it is considered that tracts of land should be acquired to be parcelled out into allotments for labourers living in neighbouring towns and villages.

Houses unfit for habitation must be certified as such by the sanitary officer.

211 out of the 213 rural district councils in Ireland have built cottages. 20,634 cottages were built under the Acts passed between 1883 and 1906.

Since 1906 18,607 cottages have been built, and in addition there were on March 31st, 1912, 3,439 cottages in process of construction, making a total of 42,640 cottages. The amount sanctioned was, on March 31st, 1912, £7,906,273, this covering the cost of 39,241 cottages built and 3,439 under construction. The average cost for building construction, roads, and land is a little less than £185 inclusive.

The reason for passing the Acts was that private enterprise could not meet the situation. All the building of cottages for poorly-paid agricultural labourers is now being undertaken by district councils under the Labourers Acts. On the other hand, private enterprise in respect of houses for some other classes seems to be normal as in England.

Land has been obtained as a rule at about 25 per cent. above its agricultural value, and at prices ranging from £25 to £60 per acre, though in some cases near towns up to £100 per acre has been paid.

The rents in the various provinces of Ireland vary as follows:—

In Ulster from 9½d. to 2s. 4d. per week In Munster from 4d. to 1s. 2d. ,, In Leinster from 6d. to 2s. 9d. ,, In Connaught from 6d. to 2s. ,,	Rates are additional and are paid by the tenants themselves. These rents include practically in all cases from ½ an acre to 1 acre of land with each cottage.

Note.—These figures give the extreme range of rents. There are very few cottages let at 4d. and 6d. per week. The average rent throughout Ireland is 1s. 1d. per week.

The cottages have been built almost entirely to re-house people living in insanitary dwellings which have been condemned by the authorities.

A provision is contained in the Act by which a tenant of a condemned cottage is allowed to remain therein until the new one is built.

The old mud cabin type of dwelling has all but disappeared, and it would seem that a few years' further administration will secure its extinction.

From one end of the country to the other the fact that new cottages could be built by the local authority has made it imperative that owners of existing property should put their old houses in order, where that was possible, if they were to escape the condemnation which was the fate of cottages in too bad a condition to be renovated. No one travelling through Ireland, even by train, can fail to notice this repair and renovation, and though the replacement in some cases of a thatched roof by one of galvanised iron or slate may be displeasing to the eye of an artist, the effect upon the health of the tenants must be very marked. More, of course, still remains to be done, as the conditions to be dealt with are so exceptionally grave.

Half an acre of land is given with the houses built under the earlier Acts, and one-acre plots are provided, as a rule, in purely rural districts under the later Acts. In some groups of cottages, however, *e.g.*, at Blackrock, near Cork, and near Dublin, abutting on urban areas, a quarter of an acre only is provided.

In the majority of cases good use is being made of the land, and great benefit is derived therefrom.

During the period over which the erection of cottages has extended, wages have everywhere increased.

The active administration of these Acts is primarily due to the power of representation possessed by the labourers themselves. The ability and willingness of the local authorities to comply with these representations is made possible by cheap money and grants in aid placed at their disposal by the Government.

Neither landlords nor farmers are, as a rule, hostile to the administration of the Acts, except in some individual cases where their own interests are affected. In many cases they express approval on the ground of the good effect the cottages have on the health and morale of the people.

There is general agreement that a marked improvement in all respects has been effected in the habits and the standards of life of the people.

Compared with the conditions prevailing thirty years ago, a work of enormous national value has been accomplished, although even to-day the standards are lower than those we are accustomed to find in rural England.

COMPARISON OF FINANCIAL PROVISIONS PRIOR TO 1906 AND SINCE 1906.

Prior to 1906.

Up to 1906 rates of interest on loans varied. Immediately before the Act passed it was as follows:—

Period.	Rate of interest.	Annuity covering principal and interest. £	s.	d.
20 years..	$3\frac{1}{2}$ per cent...	7	0	9
30 ,, ..	$3\frac{3}{4}$,, ..	5	12	2
40 ,, ..	4 ,, ..	5	1	1
50 ,, ..	$4\frac{1}{4}$,, ..	4	17	2

Assuming £170 as price of cottage and land, the following was balance-sheet up to 1906 for 50 years' loan:—

	£	s.	d.
£170 @ £4 17s. 2d. per cent.	8	5	2
Less rent, say 1s. 3d. ..	3	5	0
Loss on rates ..	£5	0	2

to which must be added the cost of collection, repairs, and insurance.

Against this loss there was granted from the Consolidated Fund £40,000 annually—this is called the Exchequer contribution. This money was divided in proportion to the Probate Duty Grant amongst six boroughs and the counties. The result was that where the Acts had been liberally used for building cottages not much relief was felt, but where few were built sometimes the entire loss was recouped.

The Act of 1906 altered this, and provided that in future £34,000 out of the £40,000 should be applied to the loss per cottage throughout the whole of Ireland. £6,000 was reserved for use as described later.

20,634 cottages were built up to 1906.

Since 1906.

The Act of 1906 provided that the several Acts passed prior to that date should also remain in force till 1916.

This Act authorised the granting of loans to Irish Local Authorities up to £4,250,000 at £3 5s. per cent. for $68\frac{1}{2}$ years, to include repayment on capital and interest.

Further, it is provided that only 64 per cent. of this charge shall be met by local authorities, the remainder, 36 per cent., being met by Government as follows:—16 per cent. out of Labourers' Cottage Fund; 20 per cent. out of Ireland Development Grant.

This reduces the charge to local authorities to £2 1s. 7d. per cent.

Labourers' Cottages Fund.

For this fund the following was placed at the disposal of the Local Government Board:—£150,000, a principal sum, Petty Sessions Clerks' Fund: £70,000, a principal sum, from Ireland Development Fund; £6,000, an annual sum, from the £40,000 referred to before; £9,000, an annual sum, from saving on Irish judges' salaries.

The above forms the fund out of which this 16 per cent. is paid by Government. The money thus provided will just about suffice to pay the amount required for 25,000 cottages.

The remaining 20 per cent. comes from the Ireland Development Grant.

Balance Sheet for Cottage on New Terms since 1906.

	£	s.	d.
£170 @ £3 5s. 0d.	5	10	6
Less 36 per cent. paid by Government	1	19	9
	3	10	9
Estimated rent @ 1s. 3d.	3	5	0
Loss on rates	0	5	9

to which is to be added cost of collecting, repairs, and insurance, also no charge for rates on cottage. In many districts the rent will be higher than 1s. 3d.

The Act of 1911 provided for the granting of another £1,000,000 in loans. The General Provisions were mainly left as in 1906.

Selection of Sites.

If the Rural District Council after representation has been made is satisfied that the Act should be complied with, then a Committee is appointed to select sites. This Committee may include other persons than members of the Council.

The points to be considered in selecting land are:—Good land; Easy access and drainage; Good aspect towards south or east for cottages; Convenient water supply; Economy in fencing by using existing fences; Minimum drainage to owner and occupier of land.

Land can be acquired either by agreement or compulsorily after making all reasonable efforts to acquire it by agreement.

The scheme must not interfere with residences, home farms, or demesne lands.

A garden not exceeding one acre can be supplied to each dwelling.

In towns or villages houses may be provided without gardens.

Requirements for Cottages.

Cottages must be built in accordance with plans issued by the Local Government Board, unless the Board consent to other plans. These plans provide that there must be one living room and usually three bedrooms.

The height of rooms on ground floor to be 8 ft.; if in roof at least 8 ft. must be given for one half of the area.

The cubic contents of living room to be not less than 1,200 cubic feet, one bedroom 900 feet, and no bedroom to be less than 600 cubic feet. Sometimes two bedrooms only are allowed.

Power is given to buy existing houses and adapt them to the standard of new cottages, but in practice this has been found to cost more than building new ones.

Allotments.

Power is given to buy land for allotments for occupants of existing cottages. The land can also be parcelled out in allotments of not more than one acre each to agricultural labourers living in neighbouring villages or towns.

Land can be acquired compulsorily, and experience has shown that this is the most satisfactory method to avoid delay and wasted time in negotiations.

The inspector can make an order confirming a scheme, or with such alterations as he deems necessary.

No duty stamp is paid on agreement in relation to purchasing land for labourers' cottages.

Conditions of Tenancy.

Cottages are let from month to month. No lodgers are allowed.

Tenants must agree to keep windows and fences in proper order.

Preference is given in letting to those tenants who have signed the requisition for cottages.

Selection of tenants who have been living in houses condemned is made imperative. Owners of condemned houses must cease to allow them to be used when new ones are ready.

Rents and Collection.

No rents are specified, but under the Act of 1906, the scale of rents requires the approval of the Local Government Board.

The Council must employ a collector and pay him a reasonable percentage on the amount collected.

The scale of remuneration is fixed by the Act as follows:—10 per cent. if cottages do not exceed 25 in number; 7½ per cent. if between 25 and 50; 5 per cent. if over 50.

The Destruction of Unfit Houses.

If a local inquiry reveals the fact that there are houses unfit for habitation, the District Council must serve a notice requiring the owner to cease to allow the house to be used when the Council are in a position to supply house accommodation for person occupying such unfit dwelling house.

Should the Council refuse to carry out the scheme judged necessary, the inspector may be ordered by the Local Government Board to exercise the powers of the Council and himself carry out the scheme.

Scales of remuneration are fixed for all officers employed in carrying out the scheme.

The Development of New Housing Areas on Town Planning lines,

by JOHN H. BARLOW, Secretary Bouruville Village Trust.

I HAVE been invited to deal with this subject because it is thought that the experience of Bournville may prove of service to others. While using that experience, however, I do not intend to limit myself to it, additional information having been supplied through the kindness of the Garden Cities and Town Planning Association, and from other sources.

It may be assumed that the need for Town Planning is universally admitted. There cannot be many defenders of the old haphazard method, or want of method, of town extension. Neither can there be many who still advocate the crowding of as many houses on an acre of land as existing bye-laws admit. While, however, there is agreement so far, difference of opinion quickly emerges when it is proposed to bring the principles of Town Planning into practice. Of all the problems leading to such difference, perhaps none is more prominent than the number of houses to be allowed per acre. Here again there is little question in theory as to the advantage of open development as contrasted with crowded development, but there appear to be certain very obvious difficulties in the way, and reformers are warned that their policy will create new problems as bad as those it is desired to remedy. It is urged that Open, or Garden City, development is costly, that it will render impossible the erection of small low-rented houses, and will end by creating so-called working-class areas where none but the most highly-paid workmen can afford to live.

Other objections, too, are sometimes heard. For example, it is said:— That the method involves housing a man at a distance from his work, thereby placing him at a disadvantage; that many families are wholly unsuited to the conditions of a garden suburb; that as a rule men do not want gardens, and would not cultivate them if they had them.

Before attempting to deal with the important economic question first stated, a word may be given to the three points just named.

With regard to the first of them, it should be noted that the movement to the suburbs is already in progress. In London it has long been a truism that the outskirts are growing at the expense of the centre. The same holds good of most large towns. Thus it was recently stated in a Birmingham paper that while there is something like a house-famine in the outer belt, "house property in the more central districts is at a discount. Slumland is not nearly so congested as formerly." The movement to the

suburbs then already exists, the question to be decided is: What kind of suburbs shall be provided for the people to move to?

Passing to the second point, its truth may be freely admitted without creating any valid objection to open development. It is unfortunately true that some families would ruin any property in which they were housed. It is equally true that immense numbers of respectable families are at present housed under most unsatisfactory conditions, that they would eagerly respond if given an opportunity to remove to better surroundings, and would treat the property in a way to prove themselves worthy of the opportunity.

The third point may be treated with equal brevity. It is true some people do not want gardens. For such there will be no lack of gardenless houses for many years to come. The number, however, who desire gardens is much larger than is often supposed. They not only want them but they cultivate them successfully when they get them. Many of the most enthusiastic amateur gardeners in Bournville knew nothing of gardening before coming to the Village, but with the opportunity the aptitude quickly developed.

It now remains to consider the economic problem stated earlier, how far open development is consistent with the provision of cheap houses for workmen. First of all, take the cost of development. As Mr. Raymond Unwin says: "To most people, whether they are interested in the land as owners or builders, or are disinterested inquirers, it seems at first sight so obvious that the more houses you put upon each acre of land the more economical is the use made of the land, and the less will each person have to pay for it, that few have really troubled to test the matter." That this widely-accepted proposition must be challenged Mr. Unwin proceeds to show, and he makes it abundantly clear that as held it is very far indeed from being correct. Let us look at some of the factors that are often lost sight of. Take, for example, a point dealt with by Mr. E. M. Gibbs, in a report communicated to the National Housing and Town Planning Council. He says, "An estate limited to twenty houses per acre will have plots of land double the size of those on an estate with forty houses per acre; and assuming the same demand for houses, it will be leased and built upon in half the time. An estate limited to ten houses per acre will have plots four times the size of an estate with forty houses per acre, and will be developed in one quarter the time. The result will be that the owner can avoid the waste of one-half or of three-quarters of the compound interest on the present value of the estate and on the expenditure on road construction; and in consequence he can afford to grant

leases at proportionately lower prices per yard." This proposition Mr. Gibbs proceeds to establish by a series of comparative statements, and sums up his paper with the words, "From the above considerations, I conclude that the limitation of the number of houses to the acre will enable the occupier to have a larger plot of land with more open and healthy surroundings, at comparatively little extra cost: and that the owner will not suffer consequent loss except in estates of small size, or under exceptional conditions."

A second consideration suggested by the foregoing relates also to the cost of the increased area of land required for open as compared with close development. If the increased area were all charged at the same price as the less area required for close building, the result, while doubtless very satisfactory to the land owner, would be less so for the builder. Would this, however, be the case? I quote again from Mr. Unwin: "There seems no reason why the land should be sold at the same price, no justification for the Garden City method of development conferring this enormous increased increment value upon the owner. We have seen that increment is due to the increased value of the land for building purposes, and it would seem more natural that it should be estimated rather in relation to the amount of building than in relation to the size of the garden attached to the building; and it is obvious that the owner of the land could afford, without loss to himself, to estimate his increment at so much per house instead of so much per acre, and where larger gardens are provided, let or sell the land at a reduced rate sufficient to recoup him first, for the loss of agricultural land, secondly, for the amount of increment due per house." Illustrations are given of how this would work, and Mr. Unwin concludes, "that there is no economic difficulty in providing for the development of land on Garden City principles, but that for practically the same cost it is possible, if the owners of land will accept the same total return in increment, to give every house a garden, which, even from the point of view of the value of its produce, will be worth vastly more than the 1d. or 2d. per week that it may sometimes cost."

The last sentence introduces a further point in the discussion, the value of the garden. I do not now speak of its value for health or recreative purposes, or of its educative effect on the character and in quickening the æsthetic sensibilities. These influences are profound and indisputable. I refer to the economic value of a garden in providing fruit and vegetables for the tenant. Tests made at Bournville indicate that the net value of the average yield per garden per week throughout the year is 2s. The yield of apples alone is surprising. From 201 reports received

the total weight amounts to 26,539 lbs., or an average of 132 lbs. weight per garden. If there were nothing else in the gardens this would be an appreciable asset to the tenant, and, while anxious not to press the matter too far, it may be fairly claimed that the garden ought to be worth considerably more than any additional rent charge it may involve.

One other point remains to be mentioned, that of the saving in the cost of road construction which is possible under Town Planning conditions. Before the passing of the Housing and Town Planning Act, 1909, there was very little elasticity in the bye-law requirements for the construction of roads, and it will be readily allowed that this led to the needless expenditure of large sums of money. Under the Act, as everyone knows, this is provided against, and it will be possible to regulate the construction of the roads, and the consequent expenditure upon them, in accordance with the traffic they will have to carry. Further, with close development there is a considerable and unavoidable loss of frontage at the numerous street junctions, which is largely avoided by open building.

As a matter of fact, with land costing £150 per acre, twenty houses per acre can be reduced to twelve for an increase in ground rent of less than one penny per house per week.

From what has been said it is fairly clear that the current idea as to the excessive cost of open development is subject to very important qualifications. It is not suggested that all the considerations named are in active operation at present, or that their force will make itself felt immediately. It takes time to adjust practice to new conditions, and it is probable that difficulty will be experienced during the transition period. But these forces cannot be neglected, and will gradually and inevitably bring about a readjustment in the interests of good housing and town planning. That this may even be a fairly rapid process seems probable when it is remembered that it is less profitable now than formerly to keep undeveloped land out of the market. Further, it must be plainly recognised, that, whatever may have been done in the past, the time has come when the public conscience demands that the old abuse of overcrowded sites must cease, and must be replaced by a better system, no matter what the cost may be.

The next aspect of the subject is the character and cost of the houses. At Bournville, which has the honour and the disadvantage of being a pioneer in providing garden city conditions for working men, many types of houses have been tried. Among housing reformers there is a prevalent opinion that to provide a small cottage with a parlour is to waste space. It is pointed out that the parlour is used only on Sundays, and not always then. It is called a museum, a receptacle for ugly ornaments, and many

other hard things are said of it. A great deal of this cannot be denied, but after all a man, and this is specially true of his wife, prefers to live in the kind of house which he likes, not in the kind which someone else tells him he ought to like. Now, rightly or wrongly, there is a demand for a parlour, and this has been recognised in houses built at Bournville.

Again, it has been urged that cooking ought to be done in some other than the living room, say, in a scullery, the living room being fitted with only a parlour grate. This admirable theory, however, makes shipwreck on the impossibility of keeping two fires going, one to warm the living room, the other for cooking in the scullery. Indeed, in one case, probably not an isolated one, the family, a large one by the way, lived in the small scullery, leaving the spacious front room unoccupied except on state occasions.

The following are some of the types of houses in Bournville. The smallest are one storey cottages containing living room, scullery, one bedroom, and the usual conveniences. These are let to single women, or to old-age pension couples, and are in great demand. It has also been thought desirable to build a certain proportion of cottages with two bedrooms. There are always some families for whom such accommodation is all that is needed, and if care is exercised to prevent the cottages being occupied by more than the recognised number no abuse arises. For the ordinary family house, however, a minimum of three bedrooms is most desirable. In Bournville the most popular house of this type contains living room, scullery, with cabinet or table bath, small parlour, three bedrooms, and of course the usual conveniences. Larger houses with bathrooms are also available. In giving these particulars it is not forgotten that custom varies, and that different districts have different preferences in regard to house accommodation. Such preferences must of course be recognised, and the above instances are given with this reservation in mind. Information as to costs will now be of interest. Some of this is taken from Bournville, some from Letchworth, from particulars kindly supplied by the Garden Cities and Town Planning Association; some again from Woodlands Colliery Village, from an article by Mr. Percy B. Houfton, the architect of the Village.

BOURNVILLE COTTAGES.

No. 1. Cost, £171.

Living room ...	13 ft. by 12 ft. 6 in.
Scullery	9 ft. by 7 ft., with cabinet bath, sink, and furnace.
First bedroom ...	13 ft. by 12 ft. 6 in., with linen cupboard.
Second bedroom ...	16 ft. 2½ in. by 7 ft.
W.C. and coal shed.	

No. 2. Cost, £220.

Parlour	... 12 ft. by 9 ft. 9 in.
Living room ..	... 12 ft. 6 in. by 12 ft., with cabinet bath.
Scullery	... 6 ft. by 4 ft. 7½ in., with sink and furnace.
First bedroom ...	... 12 ft. 10½ in. by 12 ft.
Second bedroom ...	... 12 ft. by 10 ft. 4½ in.
Third bedroom ...	... 9 ft. 4½ in. by 7 ft.
Larder, coal shed, w.c.	

Cost of gates and hedges are included, but not cost of laying out gardens. A small outlay in respect of this will be well repaid.

It now remains to consider at what rent such houses can be let. First as to the charge for land. In view of the considerations adduced earlier, and the experience of Bournville and other places, I suggest that we assume a capital cost of £450 per acre for land including development, and that a limit of twelve houses per gross acre is imposed. This means a capital charge of £37 10s. per house, or, taken at 4 per cent., an annual ground rent of £1 10s. per house, for a plot of say 350 square yards. Other charges to be met are repairs and renovation, management, insurance, and voids. Taking the two types described the rents work out as follows:—

No. 1.	£	s.	d.	
Cost—House	171	0	0	
Land, roads, sewers, etc. ...	37	10	0	
	£208	10	0	
Rent—Repairs and renovations ...	1	5	8	
Management, voids, insurance, etc.	0	17	1	
Sinking fund at 3½ per cent. compound interest to replace house in 60 years	0	17	5	
	3	0	2	
Interest on £208 10s. at 4 per cent.	8	6	10	
	£11	7	0	say 4s. 4d. per week.

No. 2.	£	s.	d.
Cost—House	220	0	0
Lands, roads, sewers, etc. ...	37	10	0
	£257	10	0

	£	s.	d.	
Rent—Repairs and renovations ...	1	13	0	
Management, voids, insurance, etc.	1	2	0	
Sinking fund at 3½ per cent. compound interest to replace house in 60 years	1	2	4	
	3	17	4	
Interest on £257 10s. at 4 per cent.	10	6	0	
	£14	3	4	say 5s. 5d. per week.

Rates are additional. In many districts both classes of house would come within the "compounding" limit.

Some figures may now be added from Letchworth:—

Large living room, scullery, two bedrooms	Let at from 4s. to 4s. 9d. per week.
Living room, scullery, three bedrooms	Let at from 3s. 6d. to 5s. 3d. per week.
Large living room, scullery, bath, and three bedrooms	Let at from 4s. 9d. to 5s. per week.

Rates are additional.

The Provision of Cottages in Rural Districts, by MISS A. CHURTON, Secretary, Rural Housing and Sanitation Association.

NOTE.—This Paper was written before the recent Government proposals to build such cottages as may be required in rural districts, to be let at economic rents, consequently this scheme is not dealt with at all. The State subsidy considered in paragraph (*a*) is that which was somewhat widely advocated at the time the Paper was written.

IT is now generally admitted that since the Housing and Town Planning Act of 1909 has been in operation, a steady improvement has begun to take place in the condition of housing in our rural districts. Those who have had the question of rural housing at heart for years past observe a very remarkable change in public feeling towards this matter. This is shown by the local newspapers. A few years back notices on this subject were few and far between: now one rarely picks up a journal without finding some reference to it. The local press in country districts abounds in reports of animated discussions at Rural District Council meetings on cottage building. Many individuals, who in the past never thought of it, are now engaged in building cottages.

As compared with the past, there has been a great advance in building by Rural District Councils. Since December, 1909, when the new Act came into force, between forty and fifty Rural District Councils have either actually carried out building operations or have advanced sufficiently with their schemes to have received the sanction of the Local Government Board to a loan. The total amount of loans sanctioned since the Act has been in operation to the 14th of June, 1913, to Rural District Councils, in connection with housing schemes, is £139,139.* To these must be added the number of councils who have been seriously considering the housing question in one form or another, approximately 140. The number of councils building new cottages would undoubtedly have been greater but for the financial difficulty which lies at the root of this, as of so many problems. With the utmost economy and the exercise of the greatest care in planning and construction, cottages can now, under ordinary circumstances, scarcely be built under £300 to £400 the pair.

The economic rent of a cottage built at such a cost is beyond the means of most ordinary agricultural labourers at their present rate of wages. With their cash wages as they are now, in many parts of the country agricultural labourers can hardly be expected to pay more than 2s. 6d. a week, and even this sum is considerably more than they have been accustomed to pay. Owing to the prevailing system of charging a customary rent for cottages, the country labourer has not been in the

* The figures brought up to October 31st, 1913, are as follows:—Number of Rural Authorities to whom loans for building schemes have been sanctioned since the Act of 1909 has been in operation, 73. Total amount of loans sanctioned, £241,984. Number of cottages to be built, 1,155.

habit of paying a rent which bears any relation to the original cost of building the house. The provision of his cottage, good, bad, or indifferent, has been looked upon as part payment of wages, and the rent he pays has been merely nominal. This is a thoroughly unsound and unsatisfactory position. Although the recent inquiry carried out by the Rural League (1912–1913) into the wages and earnings of ordinary agricultural labourers shows an increase on the Board of Trade return of 1907 of 11d. a week, yet the average cash wage for England is only 14s. 8d., and with extra earnings and allowances in kind only 17s. 9d. The increased cost of living renders even this rise more apparent than real. So that although in Durham, with an average wage of 25s. 6d., the rural labourer might be expected to pay an economic rent for his cottage, in Oxfordshire, with an average total earnings of 15s. 5d., a man with wife and children cannot do so.

What then is to be done? Three main solutions are proposed: (*a*) State aid. (*b*) Rate aid. (*c*) A rise in wages.

(*a*) The first of these is very popular just now. Whenever the financial difficulty presents itself, we observe an increasing tendency to call in the State to help. It is beyond our present scope to lay down any hard and fast line as to where State aid can be safely resorted to, but there is no doubt that in this connection there are grave dangers in such a course. A State subsidy would be simply dealing with the symptoms instead of removing the cause. Indeed, its tendency would be to perpetuate the cause. The main cause is that the agricultural labourer's wages are too low to allow him to pay an economic rent for his cottage. A State subsidy does not raise his wages; on the contrary, it makes it possible for his employer to continue to pay him an inadequate wage. We have known of a village with specially low cottage rents where the wages paid were one shilling a week lower than those in the surrounding villages. A very serious objection to a State subsidy is the effect it would have upon private enterprise, upon which we still depend for the greater part of building in the country. With a State subsidy we should be left on the horns of this dilemma: either it would be inadequate in amount, or, if adequate, would effectually check all voluntary cottage building, besides laying a very serious burden upon the country at large. The cessation of voluntary building would be disastrous. It is well known that the private individual building cottages can give to the work special supervision and attention to detail, and is, consequently, likely to get it carried out with greater economy than the State could do. Experiments, too, in special kinds of building and in the use of local materials, to which reference will be made later, are much more possible to voluntary effort than in State undertakings. The loss of all this would be most serious.

Great practical difficulties would be likely to result from such a system. In every parish a certain number of new State-aided cottages would be built, and these would be let at a non-economic rent, but it would be necessary to limit the class of tenants who might occupy the cottages to those whose income was not above a certain fixed standard; in reality, to the lowest waged labourer. State aid in this connection would be a direct subsidy to wages. Further, the employer who paid fair wages would be compelled to pay twice over. He would give a fair wage to his own men and would supplement the low wages of his neighbour's badly-paid labourers by his contribution to the taxes. Such an unfair arrangement would inevitably tend to a low level of wages all round.

(*b*) Rate aid.—Although the policy of the Local Government Board has been strongly in favour of self-supporting schemes, their sanction has not been withheld from certain schemes involving a small charge on the rates. In favour of rate aid it is urged that it is justifiable from an economic standpoint as the cottages will throughout be a valuable asset in the hands of the local authority; also that the improved housing accommodation will add to the prosperity of the parish or district involved and to its rateable value. Against it may be urged the same arguments as those which apply to State aid, but there is one important difference. In this case it is the local people themselves who decide to make the charge upon their local rates. It is not a tax levied by Parliament. This difference applies in two ways. It tends to more care and economy and a greater sense of responsibility. On the other hand the fear of increasing the rates may lead to a decision not to move in the matter.

(*c*) A rise in wages.—If the labourer is not to be assisted to pay his rent either by State aid or rate aid, some means must be found of bringing up his earnings so that he may himself do so unaided. This is the soundest and most permanent remedy. Most people are agreed that in many districts low wages are at the root of the financial difficulty, and that if this hindrance could be removed a supply of cottages would follow the demand. We are not here dealing with the question of a Statutory minimum wage, but with what we may perhaps call a natural rise in wages.

First, then, on certain estates it has been found possible to increase the labourer's cash wages simply by a process of readjustment. Thus:—the landowner has kept the cottages in his own hands; he has arranged that the farmer shall pay higher wages to his labourers, but less rent for his farm; that the labourer shall receive higher wages from the farmer and pay the landowner a higher rent for his cottage. Thus with no loss to anyone the matter has been adjusted and the financial difficulty of

cottage building has been removed. This arrangement is worthy of mention although only a small contribution towards the solution of the general problem. The possibility of increase in real wages depends ultimately upon the profits of an industry, and while the profits of agriculture are admittedly less than those of other industries, there have been signs of late of an upward tendency. We have been glad to hear recently of farmers raising wages, and of one case in which wages were raised 3s., and the rent 2s., thus removing the obstacle to future building, as in the readjustment mentioned above. The advance of agricultural co-operation should still further increase the ability of the farmer to pay better wages. It is also urged that certain burdens which press heavily on the country districts, such as roads, education, police, and the cost of lunatics, might be transferred from the rates to the national exchequer, thus still further increasing the farmer's wage-paying capacity.

Another factor which is causing a rise of wages in certain districts is the actual shortage in the supply of agricultural labour. In Cumberland we hear this has resulted in a rise of wages. Again it is also to be hoped that an improved system of rural education, which is now receiving so much attention, will result in a class of agricultural labourer better worth a higher wage. In considering the real earnings of the labourer, the value of the cottage garden must not be omitted, as its produce should form a definite addition to his income. Too often new cottages are built without gardens, but if a good garden is provided it should be worth 1s. to 1s. 6d. a week to him.

We have so far considered the possibility of the labourer's means rising to enable him to pay for the cottage: but there is another side to the question, how far (apart from outside aid) the cottage can be brought within the means of the labourer; in other words, can the cost of building it be legitimately cheapened? Some very interesting experiments in this direction have been made of late. Building in wood is being advocated, and is actually being tried in more than one locality. In Cornwall the vicar of a rural parish has been doing very useful work in this way. He claims that a six-roomed standardised cottage built on his lines would cost not more than £125 in his locality (the price quoted is for materials and labour, January, 1913). In Yorkshire Mr. Swain has succeeded in building a concrete cottage, containing dining-room, scullery, larder, bathroom, and three bedrooms for £88 12s. Some of his materials, however, were obtained free of cost.

The use of local materials will sometimes considerably cheapen the cost of building, as in the case of the chalk houses at Winterslow, near Salisbury.

Encouragement to such efforts has recently been given by the attitude of the Local Government Board to rural by-laws, as seen in their recent circular to Rural District Councils. Section 44 of the Housing, Town Planning, etc., Act, 1909, also provides for the relaxation of by-laws in cases where building is hindered by their stringency. The difficulty in connection with districts which are partly urban and partly rural has been met in some instances by an exemption clause for small detached dwelling-houses. It is satisfactory to note that the number of rural district councils having by-laws substantially following the urban model has decreased, although the latter still constitute thirty per cent of those that have by-laws for their whole districts. This increasing tendency to adapt by-laws to purely rural, as distinct from urban, conditions should encourage the use of local materials and new experiments in construction, from which we may reasonably hope for a considerable reduction in cost.

In these two directions then, an increase in the earnings of the labourer and a reduction in the cost of building his cottage, the pressure of the financial difficulty may be relieved. A few general suggestions for increasing the number of cottages may be added.

It has been proposed that landowners and proprietors of large works should be required to build cottages according to the value of their property, and that public bodies should house their own employees. The nearer the rents of these cottages, including those built by Rural District Councils, approach an economic figure, the greater the stimulus to private enterprise in building. Even where the rent asked is beyond the means of the ordinary agricultural labourer, in many places the effect should be to relieve the pressure on the existing cottages by the moving up of those inhabitants who can at once afford a higher rent.

It has been suggested that in districts so poor that to undertake building seems impossible, the case might be met by the County Council carrying out the work as is provided for in Section 13 of the Act of 1909.

One cannot refrain from mentioning, in conclusion, how much is being done by Rural Health Officers to save existing cottages and to bring them up to present-day standard, by inducing owners to undertake timely repairs, and to make such additions as are necessary for health and decent living. One Sanitary Inspector stated that he had been able to get more done in one year since the Housing Act of 1909 had been in operation than in ten years previously; another Inspector, with whom the Rural Housing Association has been in correspondence, writes that he has succeeded in persuading a fair number of owners of two-bedroomed cottages to build a third bedroom over the scullery, which can be done at a small cost, and where no scullery exists he has got several owners to build one with a bedroom over. All such work as this is most valuable.

The Housing Question (a Sanitary Problem), by Reginald Brown, M.Inst.C.E., F.S.I., M.Inst.M. & C.E., Engineer and Surveyor to the Southall Norwood Urban District Council (member.)

THE particular object of this paper is to deal with unhealthy dwellings under Part II. of the 1890 Act, and under the 1909 Act. In 1911–1912 the number of local authorities proceeding under Part II. of the 1890 Act was 850, or 46 per cent., whereas during the previous year the number was only 474, or less than 26 per cent., the majority of which had taken proceedings relating to buildings unfit for human habitation.

Excluding the Metropolis, in 1910–11, 467 authorities took action, the population of the districts being 12,346,312; 6,347 houses were reported to the local authorities, in respect of which no action was taken in 284 cases, 3,049 were rendered fit, 1,377 were closed or demolished voluntarily, 1,476 had closing orders made against them, of which 274 were determined, and 170 had demolition orders made against them.

In 1911–1912 local authorities showed greater activity, 830 local authorities took action, the number of houses reported to the local authorities increased to 23,034, the number rendered fit to 6,990, the number closed or demolished voluntarily was 1,388, 4,627 had closing orders made against them, 728 orders were determined, and 494 had demolition orders made against them.

In this year there were 5,738 cases in which the local authorities decided not to take action under Part II. of the 1890 Act, but out of this number 5,221 were dealt with under Section 15 of the Housing and Town Planning Act, 1909. It is as well to bear in mind that the 1890 Act was permissive, whereas the 1909 Act is compulsory. Under the 1890 Act, proceedings for closing unhealthy dwellings had to be taken in a court of summary jurisdiction, and in many cases difficulty was experienced in getting magistrates to make closing orders. The figures previously given for 1911-12 shows the activity of local authorities, due, principally, to the powers given by the Housing and Town Planning Act, 1909, by which local authorities *themselves* make "closing" and "*demolition orders*," subject to appeal to the Local Government Board. This power is a very wide one, and unless "strength is tempered with mercy" may be the cause of very great hardships, not only to property owners, but also to occupiers. The Local Government Board is evidently desirous of local authorities dealing with the question in a broad spirit, and proceeding, as far as possible, with "reform by steady steps," rather than "at the pace that kills"; for in the Board's memorandum to local authorities they desired that, as far as practicable, proceedings should be taken under Section 15,

and not under Section 17. The Board evidently foresaw the inconvenience and hardships that would be caused by local authorities ignoring the powers conferred upon them by Section 15 of the 1909 Act. The provision of healthy and reasonably-rented houses is such an acute question that anything which renders it more difficult should be discountenanced; unless it is the object of local authorities to, themselves, provide workmen's dwellings and to put a stop to private enterprise. Some local authorities, however, proceed direct under Section 17 of the 1909 Act, without considering whether the case could not be met under Section 15 of the same Act.

What is the important difference between the two sections? It will probably be of interest to briefly deal with the various sections relating to this matter. These sections are 14–17.

Section 14 of the Act provides that, with certain exceptions, houses of a rental value of not exceeding £26 in boroughs and urban districts with a population of 50,000, or £16 elsewhere, if let after the passing of the Act shall be in all respects reasonably fit for human habitation. In the majority of the districts the rental value will thus come under the £16 (just over 6s. per week) heading. Section 15 of the Act provides that such houses shall be kept *by the landlord* reasonably fit for human habitation during the whole of the tenancy. This obligation is to be enforced by the local authority who, in default of the landlord carrying out his statutory obligations, may serve a notice on him to execute certain works to be specified in the notice, and if not done the local authority may do the work and recover the expenses. The landlord has, however, the right of appeal to the Local Government Board against the notice. Local authorities have done a great deal of work under Section 15: thus from the 31st of December, 1909, to the 31st of March, 1911, 18,927 houses were dealt with by notice, 679 of which were closed voluntarily by the landlord rather than put the houses into a sanitary condition, 11,649 were rendered sanitary, and the local authorities did the necessary work, on the landlords' default, in forty cases only. This is, however, not a complete record, but only relates to the work done by 500 out of 1,840 of the local authorities in England and Wales. Although proceedings to enforce repairs to houses over £16 rental value cannot be dealt with by Section 15, although unfit for human habitation, local authorities, in some instances at least, deal with such cases under Section 17 of the Act instead of enforcing the provisions of other Acts under which they have powers. Now this Section (Sec. 17) is a drastic one, as under it a local authority is compelled to make a thorough inspection of the district, and to keep proper records, etc., as to the

sanitary condition of the houses in their district. Under Article 2 of the Housing (Inspection of District) Regulations, 1910, the following matters have to be inquired into and recorded:—

1. The arrangements for preventing the contamination of the water supply. 2. Closet accommodation. 3. Drainage. 4. The condition of the dwelling house in regard to light, the free circulation of air, dampness, and cleanliness. 5. The paving, drainage, and sanitary condition of any yard or outhouses belonging to or occupied with the dwelling houses. 6. The arrangements for the deposit of refuse and ashes. 7. The existence of any room which would in pursuance of Section 17 (7) of the Act be a dwelling house so dangerous or injurious to health as to be unfit for human habitation. 8. Any defects in other matters which may tend to render the dwelling house dangerous or injurious to the health of an inhabitant.

NOTE.—Section 17 (7) is as follows:—

> "A room habitually used as a *sleeping place*, the surface of the floor of which is more than 3 ft. below the surface of the part of the street adjoining or nearest to the room, shall be deemed to be so dangerous or injurious to health as to be unfit for human habitation if the room is either (*a*) not on an average at least 7 ft. in height from floor to ceiling, or (*b*) does not comply with such regulations as the local authority, with the consent of the Local Government Board may prescribe for securing the proper ventilation and lighting of such rooms, and the protection thereof against dampness, effluvia or exhalation."

It will be seen that certain matters have to be recorded, but it does not give any standard by which it can be judged when the "line" is crossed between a house fit for habitation and one unfit. In the majority of instances, fortunately, the powers have been liberally interpreted, but doubts have arisen as to the class of house which comes within the operation of the section, because it must be borne in mind that when the section is enforced there is no alternative but to proceed with a closing order, and, if necessary, with a demolition order. Three classes of houses, at least, appear to come within the section:—

1. Houses in such a state as to be dangerous or injurious to health, so as to be unfit for human habitation. 2. Back-to-back houses (see Section 43 of the Act). 3. Underground rooms habitually occupied as sleeping places (Section 17 (7) of the Act), see above.

Dealing with 2 and 3 first.

Back-to-back Houses.—Section 43 of the Act prohibits the erection of back-to-back houses, but with the proviso that a house containing several tenements may be erected, in which the tenements are placed back-to-back if the medical officer of health certifies that the several tenements are so constructed and arranged as to secure effective ventilation of all habitable rooms in every tenement.

Underground rooms.—In Sec. 17 (7) there is an important proviso "a closing order made in respect of a room shall not prevent the room being used for *other purposes* than those of a sleeping place, and further that Sec. 18 relating to demolition orders shall not apply." This is somewhat important inasmuch as it allows an underground damp room to be used for other purposes except as a sleeping place. It would therefore appear that such rooms may be used for stores or even living rooms, and if this is correct then it is clear that the want of damp-courses causing dampness in the walls of a room on the ground-floor is insufficient cause for a local authority to close a house so long as those rooms are not used as sleeping places.

Houses unfit.—Whilst headings 2 and 3 are comparatively simple, it is not so easy to lay down any hard and fast rules as to heading 1. It behoves inspecting officers not to be too drastic in their recommendations, but to bear in mind that once "representations" are made the action of the local authority is based thereon. All sanatarians have ideals which they would like to see attained, but a great many of these can be realized by moral persuasion rather than by legal process. The "inspection of district" regulations should be strictly followed when making representations. Although it is essentially necessary to prevent contamination of the water supply, it seems to be stretching a point to try to compel each house to have a separate supply when an ample and pure supply is obtainable within a reasonable distance, and especially when an authority puts in force Sec. 17 of the 1909 Act to obtain separate supplies.

Without labouring the points covered by the Inspection Regulations, the author would simply suggest that many of the defects found can be remedied by the powers conferred upon local authorities other than those conferred by the 1909 Act, and that these latter can only be usefully applied when all other attempts have failed. Whilst one of the objects of the Housing Acts is to ensure that houses shall be let and kept in a proper state of repair, failing which they are to be closed, and if necessary demolished, the too rigid enforcement of Sec. 17 may lead to a considerable number of houses being closed. If a dwelling house can be made *reasonably* fit for habitation, owners should be encouraged to do this under Sec. 15, and the demands of the local authority should always be reasonable.

Since the 1909 Act became law, much has been done to improve cottage dwellings and still much more remains to be done.

In conclusion it may be noted with pleasure that in future the Local Government Board intends to issue, separately, a report on Housing and Town Planning, which will form a very valuable record of the efforts of the local authorities in dealing with this momentous question.

MR. J. R. PAKEMAN (City of London), said that the subject of the Housing of the Working Classes was constantly occupying the attention of the authorities in London, but there, and probably in most large cities, the initial difficulty in dealing with the question consisted in the apparent disregard of the people themselves for anything clean and sanitary, a fact most noticeable in seaport towns, where aliens of a most undesirable kind landed. Unless the legislature took steps to safeguard the towns from the influx of such undesirables, and also created powers to enforce cleanliness and sanitation, he was doubtful whether much good would be served by pursuing the question of better housing. To provide clean dwellings for people who had not learned to appreciate cleanliness seemed a reversal of the proper order of procedure.

The financial aspect of the question was very difficult, as local authorities would find little encouragement from the already highly-taxed people in their localities, and apparently the only solution would be a State-aided scheme, which, after making provision and creating drastic remedies against unclean people, would then establish means for erecting suitable dwellings. The City of London would always welcome and vigorously support any efforts in that direction.

MR. KELWAY (Falmouth) said free cottages had been advocated in rural districts; but he thought it was simply perpetuating white slavery to set up a system whereby if a labourer lost his job he lost his cottage.

MRS. ELIZABETH MORRIS (Camberwell) said the housing question in a large degree affected Poor Law relief, inasmuch as widows receiving, say 3s. 6d. to 4s. 6d. per week from the Guardians, had very little left to buy food, when at least 2s. 6d. must be paid for rent, even if only one room was necessary. And it was very much harder on the woman with children dependent on her, as she, although possibly receiving 5s., or even as much as 8s., according to the number of children, was forced to use at least 4s., and often as much as 5s., for rent, which meant that the money which should be expended on necessary food for the children, went for rent. If houses for that class were built at less cost, more for utility than ornament, it would go a great way towards solving the question of overcrowding. At the present time so many of the houses built by municipal bodies were very costly, and let at quite a prohibitive rent, from 9s. to 12s. 6d. per week, that they in no way came within the means of the very poor, and in many cases were tenanted by the workmen of the Borough Councils, who generally received not less than 30s. per week. To be useful to the very poor, flats or tenements should be built on very economical lines, and let at, say, from 4s. to 6s. per week, and thus enable widows who were receiving relief to take advantage of them.

The Liverpool Corporation had provided its workmen with dwellings at low rents, to cover cost of which a rate was levied (she believed of 2d.), but one could

not help wondering whether it was altogether fair to those ratepayers who had a struggle to meet their liabilities (particularly small shopkeepers and those who could not avail themselves of these houses) that they should have to contribute the money for this purpose.

One would feel interested to know if the Corporation of Liverpool were able to collect their rates without in many instances issuing summonses to these same small shopkeepers.

Nevertheless, it was a problem which should receive the very serious consideration of every borough, and also of the Guardians, as it was so closely bound up with the administration of relief.

Councillor David Adams (Newcastle-on-Tyne), said it was instructive to note the marked divergence of views expressed upon the question of State aid towards housing the poorest in town and country, and the admission that the largest factor in bad or inefficient housing was low wages. Miss Churton deprecated State-assistance; Mr. Aldridge advocated it. Profits, said Miss Churton, had risen; wages must do so, but by persuasive and voluntary effort only. There must be no interference by law, and economic rents should be paid for all cottages. He (Mr. Adams) asserted that the root of the problem lay in the low wages received, the chronic poverty of the people. The standard of wages paid had no fixed relationship to profits earned, and was frequently lower in the more lucrative undertakings. A national minimum of sanitation by law was in process of gradual establishment; a legal national minimum of wages must be applied to all trades. The degradation and servitude of the individual, with its senseless loss to the community by the continuance of toiling poverty, should forthwith be brought to a close. We had accepted State- and rate-aid for education, baths, libraries, asylums, and sanatoria, why not also for the chief factor in modern civic expenditure, the housing of the poor? The principle was not new. On Tyneside they had a great army of under-paid, fully employed factory workers, receiving from 17s. 10d. to 22s. weekly. Many of the children of these in the elementary schools of Newcastle were declared necessitous, and fed daily at the public cost. Frequently the workers themselves received rate-aid in hospitals and dispensarie sthrough the poor-law and in kindred directions.

Private enterprise had proved itself hopelessly inefficient in the provision of homes for any grade of workers; it had now, happily, withdrawn altogether from attempts to house the poor. The local authority, supplemented by State assistance, alone remained. Not only must it house, like Liverpool, but colour, beauty, and architectural fitness must be restored to the dwellings of even the poorest.

The tendency of the age was inevitably towards more and more social legislation. To the State, which was the community, must we look, rather than to voluntary efforts or trades-unionism alone, to modify the wage-earners'

struggle, and to give to the workers the possibilities in every direction of destroying evil material conditions, and supplying in generous abundance the means of fully realising life.

MR. JOHN T. COWDEROY (Kidderminster) said they not only needed a standard of sanitation for house owners, but also a standard of cleanliness for the occupiers. They needed more summary powers to deal with people who kept their houses dirty. They should be as able to summons dirty people before the magistrates as quickly and easily as a School Board visiting officer summons a parent for neglecting to send his child to school. If people would not love cleanliness they should be made to observe it; hence clear and understandable by-laws or statute laws were urgently needed. They were constantly talking of the slum owners' responsibility, but rarely of slum occupiers. Better houses did not always mean cleaner houses, with some people.

COUNCILLOR D. WILLIAMS (Mayor of Swansea) said people were very much concerned about the rates, but all he was concerned with was the death-rate, and if they could reduce that it would be the most important reduction of all. At the bottom of the housing question was the land, and they wanted to deal with that matter, and to prevent monopolies getting such high prices where land was required for public purposes.

COUNCILLOR THOMAS MYERS (Dewsbury) said they had to muster as much courage in demanding municipal housing for the very poor as they did in applying for closing orders.

MR. D. PUGH-JONES (Cardiff) was of opinion that the housing of the working classes could not be effectually dealt with until land could be obtained for a reasonable amount. The price of land in South Wales amounted, in some cases, to 6d. per square yard per annum, 2d. being quite common; 2d., 5d. and 6d. per square yard would be equal to £40 6s. 8d., £100 16s. 8d., and £121 per acre per annum respectively, or at twenty-five years purchase say, £1,008 6s. 8d., £2,508 6s. 8d., and £3,025 respectively. Such high charges for land, irrespective of the cost of roads, fees, etc., made it difficult to erect cheap dwellings even when the houses were crowded on the land, which was most undesirable. Housing in urban districts, particularly in mining and in other industrial districts, was in his opinion far more important for the time being than in agricultural districts, as not only hundreds, but thousands of persons had to be considered, while in rural areas only a practically small number had to be dealt with.

COUNCILLOR AUSTIN HARFORD (Liverpool) said in connection with rehousing, experiments and methods of every description had been tried in Liverpool for many years past, and had failed except the present policy of restricting the

rehousing to those turned out of insanitary areas, and of building as near as possible to their work at rents approximate to those paid for the old houses.

Nearly all the insanitary areas of Liverpool had been, and those still remaining were, contiguous to the docks, upon which most of the population depended for their employment; it was consequently necessary for them to live close to their work, which was of the casual labour kind, and meant that those following it belonged to the poorest or the labouring class.

In 1864 there were 22,000 insanitary houses in the city. From then, operating under a local Act passed in that year, insanitary areas were being constantly cleared until 1896, and it was computed that about 10,000 houses were demolished without any of their inhabitants being rehoused by the Corporation. It was true that in 1885 a large insanitary area known as Nash Grove was cleared, and on the site there was erected tenements five storeys high for a population of 1,300 persons; but reliable statistics went to prove that not one of the displaced tenants entered into them, and they were occupied then and were now occupied by a better class artisan than the dispossessed, who came from other parts of the city, the dispossessed meanwhile overcrowding elsewhere, making bad conditions worse. In consequence, the Housing Committee of Liverpool in 1898 determined to restrict all their future housing schemes to the people they dispossessed from the insanitary areas. That policy had proved to be eminently successful. The percentage of the actual dispossessed that had been rehoused, for instance, in the last six rehousing schemes ranged from 66 to 99 per cent. Altogether the Liverpool Housing Committee had built upwards of 2,300 dwellings for the dispossessed at a cost of 1½d. in the £ on the rates, which included the price of the land and the cost of rebuilding. In view of the awful conditions that prevailed formerly (disease, vice, and crime constituting an ever present menace to the health and good government of the community as a whole), Liverpool believed that the money had been well expended. The death-rate in the districts affected had been halved; typhus and typhoid, which were rampant, had practically disappeared; phthisis had decreased from 4 to 1·9 per thousand; drunkenness and other offences against the law had enormously declined, in some areas to an infinitesimal point, and on all hands a fine tone of individual self-respect, cleanliness and sobriety, and a high moral standard, had been engendered among the very class which, under the old order of things, was the rejected of the city, and considered beyond all redemption in social amelioration.

Alderman E. Desquesnes (Salford) said it was most useful to learn the experience and to study the examples of various parts of the country, but it was a mistake to generalise from any particular case, as the greatly varying conditions of different places often called for different treatment. From what he had heard in the two days' discussion of this question he was inclined to think that some persons considered that the last word in housing reform had been pro-

nounced by Liverpool. The representative of that city had told them that the Liverpool policy was to destroy the slums, re-erect dwellings on their site, and to bring back the dispersed slum dwellers to their original area so as to prevent their contaminating better people by their slum habits. If, however, environment counted for anything, was it not better to disperse the lower strata and give them the advantage of better human surroundings?

In the town (Salford) he represented, as in many other large centres of population, the opposite policy to that of Liverpool had been successfully adopted. This policy had been assisted by the local phenomenon due to the advent of the motor-car, the electric tramcar, and other facilities for easy locomotion, which had resulted in a general moving up and moving away of all classes of the community from the centre of congestion. When they wiped away the slums their former habitants, in the main, found awaiting them better classes of houses, vacant from the causes indicated, and an undesirable aggregation had been broken up. Local conditions had favoured such a result, and the moral was, that no general rule could be laid down, but each community must select its own example from cases which most approximated to its own.

DR. J. W. MILLER (Hereford) said he agreed that where a site had been cleared it was not reasonable to expect the local authority to erect houses on the same site at the same rental as the houses demolished. If houses were built at a higher rental, and not necessarily on the same site, there would be a moving up. That had been the experience in Hereford; a number of houses were demolished and thirty-three houses erected, at rentals of 4s. 9d. per week upwards, in another part of the city by Hereford Co-operative Housing, Ltd. These houses had all been occupied, and also the houses vacated; in several instances there had been several movings up, as a certain proportion of the houses demolished had been let at rentals as low as 2s. per week.

ALDERMAN J. C. JULYAN (Poole) said we had to realise that we were suffering from the neglect of past generations. If the same activity and interest had been shown thirty years ago that prevailed to-day the problem would be less acute. He would like some practical suggestions as to finding the money to do what was needed. It was evident that whether we approved of State aid or not, it had been successful in Ireland, judging from results; and in his opinion the time had arrived when the Government should provide similar assistance to England.

Notwithstanding that the demand was so great for cottages, both rural and urban, it was a fact that local authorities were receiving fewer plans to pass than for some years previous to the passing of recent legislation, and it ought to be possible to get at the cause of that and to find a remedy.

With regard to the assertion that the finding of 1d. or 2d. a week by the working class was not such a bar as we were asked to believe, he

thought that it was the experience of those engaged in social work that the combined income of the home was not always wisely expended, and whilst he would be the last person in the world to object to all reasonable forms of sport and recreation, he was forced to the conclusion that there was to-day, from the top to the bottom in all classes of society, a tendency to excess in unhealthy forms of pleasure, and we found hundreds of thousands of people expending on football matches and picture palaces sums that would go a long way to help in improving the standard of comfort in the home. He thought what was wanted was to educate them to realize their responsibilities as citizens, and how much they had it in their power to bring about very considerable improvement in their own homes. He trusted that the efforts that had been instituted by the National Health Week Committee would eventually receive the support they deserved.

Miss M. S. Kilgour (London) said she regretted four lines in Mr. Brown's paper, in which he thought it to be stretching a point to try to compel each house to have a separate water supply. It was immensely important that the working mother should bring up her children cleanly, and how was a woman with an infant in her arms and another clinging to her skirts to fetch and carry water? There was no one who was asked to make bricks without straw except the mother in the working man's home. Yet if children were brought up cleanly to five or seven years of age they would never go back from cleanliness; and if they were not cleanly much was spent in the schools and otherwise to remedy that. The good and strong mother was often broken down before her time by the efforts she had to make, and the less strong often became reckless and made a bad tenant.

Miss Churton, in reply, said the difficulty of cottages not being free had been met, on certain estates, by the owner letting the cottages direct to the labourers, instead of letting to the farmer with the farm, so that when the labourer left one farmer he could go to another without quitting his cottage.

Mr. Aldridge said, of all the problems they had to deal with, that of the alien was the most difficult. He preferred that cottages should be under the Rural Council. In regard to the argument used against State-help, he reminded them that without State-help and stimulus three hundred and twenty-five cottages had been built in the last three years, and he left it to them to work out how long it would take to complete the one hundred thousand which it was estimated that rural England required.

The Control of Indiscriminate Spitting, by D. MORLEY MATHIESON, M.A., M.D.(Edin.), D.P.H.

ABSTRACT.

THE subject of the paper, from which the following excerpts are taken, was the part played by indiscriminate spitting in the spread of tuberculosis; with reference to the need for compulsory control of spitting in public places. Sputum being a form of excrement, it is somewhat remarkable that the unwritten laws of decency should not already in great measure have controlled its disposal. There can surely be no strong reasons why this particular human by-product should be looked upon with especial tolerance.

1. *Difficulty of the control of spitting among the tuberculous only.*

It is over thirty years since the infectious character of sputum from patients suffering from pulmonary tuberculosis was first demonstrated. As a result attention was soon directed towards the disinfection of such sputum, and phthisical patients are now instructed to expectorate into spitting flasks or paper handkerchiefs. Meanwhile, no such observance is asked from the sufferers from chronic bronchitis and from other habitual spitters. The result is, to some extent, to brand the man who, in public or when at work, exercises decent care in the disposal of his expectoration as a consumptive.

2. *Need for control of indiscriminate spitting. Voluntary and compulsory methods.*

If we accept the view that tuberculosis is being freely spread to-day by indiscriminate spitting in the homes of patients, in vehicles, in public theatres and halls, and in the streets, the question that must at once present itself is, how is this infection to be controlled? We hear a good deal about the gradual educating of public opinion. Undoubtedly, as has already been said, there is in the public mind a growing feeling that the disposal of expectoration ought to be controlled, but, after all, this feeling is practically restricted to certain sections of the community: indeed, to those sections where phthisis is comparatively uncommon, and where its presence is detected early. There remains the large majority who are thoughtless and potentially dangerous. The method has been tried of appealing to these with public notices bearing the request "Please do not spit." Personally, I am of opinion that these notices, although effective with the more thoughtful, simply do not disturb the equanimity of the class we most want to reach. Their effect is, frequently,

merely to remind the casual reader that he can spit if he likes, and many lose no time in asserting themselves by practical demonstration. I am convinced that no marked decrease in the habit of spitting will be seen until by-laws have been obtained for its control, not only in covered places, halls, etc., but also to some extent in the public streets.

3. *Administration.*

By-laws for the control of spitting can be made under section 23 of the Municipal Corporation Act, 1882, which provides (sub-section 1) that a council

> " . . . . may, from time to time, make such by-laws as to them seem meet for the good rule and government of the borough, and for prevention and suppression of nuisances already punishable in a summary manner by virtue of any Act in force throughout the borough, and may thereby appoint such fines, not exceeding in any case five pounds, as they deem necessary for the prevention and suppression of offences against the same.

After being passed by a local authority, by-laws are submitted for approval to the Home Office. The Home Office has a model form of by-law for the control of spitting in covered places which reads,

> "No person shall spit on the floor, side, or wall of any public carriage, or of any public hall, public waiting room, or place of public entertainment, whether admission thereto be obtained upon payment or not."

Permission for the adoption of this by-law is readily granted. With regard to a by-law to control spitting on public foot-paths, the Home Office has hitherto been reluctant to give sanction. I believe that Southport in 1910 was the first town in this country to get such a by-law. At the present time only Southport and Birmingham (which followed in 1911) have it in force. Early in this year (1913) my own authority, the South Shields County Borough Council, by a practically unanimous vote, decided to apply for the model by-law, and for another by-law to control spitting in the public streets (except into gullies and channels). The reply from the Secretary of State was to the effect that he would readily sanction the model by-law, but that he has hitherto hesitated "to allow any extension thereof so as to apply the prohibition of spitting in the public street. The reason for this" (the letter continues) "has been that by no means the same danger to health or annoyance to the public arises from spitting in the open as from spitting in covered places; that the enforcement of a widely-extended prohibition of spitting must be attended with great difficulty, and that general practice and opinion have not sufficiently advanced to justify any sweeping provision." Before sanctioning the wider by-law the Secretary of State asks for certain information, *e.g.*,

1. Whether the by-law is desired as part of a considered scheme for the purpose of checking the spread of consumption.

2. What other steps have been taken or are to be taken in this direction.

3. Whether the medical officer of health has had the matter under special consideration and has made any report thereon.

4. What steps the Council would propose to take for the enforcement of the wider by-law if allowed, *e.g.*, what officers apart from the police would be charged with this duty and what directions would be given them for the purpose.

This information was supplied; the decision of the Home Secretary has not yet been received.* With regard to the points raised in this letter: public opinion in a district is generally sufficiently advanced to merit a health reform, when the reform in question has been asked for, practically unanimously, by the local authority. Again, it is admitted that tuberculous dust in closed halls, etc., has more chance of remaining virulent for long periods than street dust; but, on the other hand, street dust is continually being set in motion and inhaled, and also undoubtedly causes infection of food exposed for sale. The *educative* value of general control is obvious, and need not be emphasised.

With regard to the difficulty in administration, this has, I think, been somewhat exaggerated. In the United States many of the principal cities have for several years had laws for prohibiting spitting in the streets, and these laws are stringently carried out. Dr. Robertson of Birmingham has shown that in San Francisco the practice of spitting has diminished so much that offences are now very uncommon; and that in New York the decrease in spitting has been remarkable. In Chicago a method of wholesale prosecution was adopted which would probably not commend itself in this country, but which has certainly been most effective. At intervals, for a period of a week, the law was stringently enforced without warning; all offenders, whatever their social standing, being arrested and prosecuted.

The method which Dr. Robertson himself has adopted in Birmingham would probably be approved by most administrators in the country. Action is not taken against an offender unless it can be proved that he has been previously warned. Although the enforcement of the by-law is mainly in the hands of the police, any inspector of nuisances can take proceedings, and this is sometimes done. The administration of the by-law has apparently produced practically no friction. I am indebted to Dr. Robertson for information on these points, and for his estimate that

* Since the above was written a reply has been received, stating that renewed application should be made for the wider by-law at the end of one year.

the practice of spitting in the Birmingham streets has greatly diminished (by one-half at least) since the by-law came into force two years ago.

Dr. A. W. Fortescue Sayres (Devon County) said that the infection of tuberculosis, at any rate pulmonary tuberculosis, was spread through the sputum far more than through milk and meat.

He thought that the notices by municipalities and railway companies cautioning against spitting had decreased a habit which was at one time very prevalent; it had, in fact, made spitting unfashionable.

He hoped that it would soon be made a penal offence for a notified tuberculous patient to spit anywhere but into a sputum flask in which disinfectant had been placed. There should be ready means of obtaining these sputum flasks from the sanitary authority. As a county tuberculosis officer he maintained that the sputum flask was important in country districts as well as in cities.

Spitting into pocket handkerchiefs and pieces of paper were inefficient on account of soiling and infecting the interior of the pockets.

The destruction of sputum was difficult in country cottages where no water closets existed. It resolved itself into burning, boiling, or burying. The burning of a cupful of sputum and disinfectant was unpleasant. He suggested that making a bolus with sawdust and then placing in the fire made this process more possible.

People generally had a disinclination to boil sputum. With burying it was questionable whether the tubercle bacillus was satisfactorily destroyed without being first dealt with by strong disinfectant or boiling.

Mr. Leo Taylor (City of London) said he felt he must take exception to the statement in the paper to the effect that notices bearing the request "Please do not spit" were without effect. He stated with full confidence that great alteration had been effected in London by the notices, "Prevention of consumption, do not spit," and "Do not spit on the footpath," which were now exhibited in the streets, at the railway stations, and in tramcars and public vehicles.

Anyone who knew the great London termini, where thousands of workmen poured into the City every morning, must bear witness to the vast improvement which had been effected in recent years. Formerly expectoration was common and disgustingly in evidence on the platforms and approaches to the stations, but now, thanks to the common sense of the people being aroused to the dangers of disseminating disease by spitting, the instances were rare.

He did not believe in too much threatening of penalties. Reason went further and was more effective. When in Austria he noticed that almost everything was "Verboten," or, at least, it seemed so from the notices exhibited, and he failed to see that anyone cared much for the threats and penalties attached.

He claimed that London had been and was being taught common sense sanitation, and he believed it the only effective method.

Discussion on the Future Organisation of Health Week.

Exeter Congress.

Mr. Arthur J. Martin (Westminster) in opening the discussion said there was no need to say much about the need for a Health Week. The Registrar-General's annual returns gave the number of deaths from the different diseases, but it was safe to say that more people died from ignorance than from any other single cause: ignorance of the laws of health, ignorance with regard to the causation and prevention of disease, ignorance of the principles of nutrition, ignorance of all that pertains to the birth and rearing of children. The annual reports of the medical officers of health told the same tale, and showed how seriously their work was hampered by the ignorance and indifference of the people.

There were some who, while admitting the desirability of a Health Week, said that medical officers had already so much to do that they could not spare time to take part in it. But some of the most successful celebrations had been organised by our busiest medical officers. And after all, Health Week was not an obligation, but an opportunity, of which each district could avail itself or not, according to its circumstances and needs. The value of a local celebration did not consist in the length of the programme; on the contrary, some of the most modest Health Weeks had been amongst the most successful.

Another objection sometimes heard was that it was not desirable that the public should dabble in matters of health, and that it was best to leave these to the officials. But this was impossible. The chief executive health officers were the mothers of the family, the women in the home, and if these were ignorant or negligent, the best work of the medical officers and their capable staffs would be done in vain.

It should not be forgotten that the public already received plenty of health tuition, of a kind. Cranks and faddists were rampant. The pages of our newspapers and magazines teemed with advertisements of patent foods and quack medicines. Was it not time that the responsible exponents of health took a share in the educational work? There might be no need for people to think more about their health than they did at present: some of them possibly thought too much about it; but let them at least think sanely.

Granting the need for instruction, they might be asked "Why a Health *Week?* Was it not better to rely on quiet educational work carried on steadily throughout the year?" The answer was that we needed both. To seek to instruct the masses of the people in hygiene without first making a serious effort to secure their attention was to attempt the impossible, and to take no account of human nature. The churches and the political parties realised the need for special occasions, and we could no more afford to dispense with such occasions than they could.

The apathy which prevailed with regard to health was profound and widespread, and in our efforts to dispel it we needed the aid of every agency which

had a share in moulding public opinion. In particular we wanted help from the Press, the teaching profession, and the clergy. We did not ask the clergy to give technical instruction in hygiene, but what they could do, and what they ought to do, was to arouse the consciences of their congregations to a sense of their personal responsibility for their own health and that of their children, their employees, and others who might be dependent on them.

So much for the need for Health Week. How had we carried it out?

In the first place we formed a small working committee, composed of a few well-known medical officers and members of the Agenda Club and of the leading Health Societies, with Professor Bostock Hill as its chairman. Then we got together an Advisory Council, comprising representatives of all the national health-promoting societies. The committee next got into touch with the medical officers of health throughout the country, who were mainly instrumental in the organisation of Health Week in their respective districts. In many towns the Guilds of Help also rendered valuable service. The celebration of Health Week in each centre had been arranged and controlled by the local committees, the central committee providing literature and lecturers where required.

The observance of Health Week this year showed a marked advance on 1912. Organised programmes, many of them on a very large scale, were carried out in fifty cities, towns, and metropolitan boroughs. Minor celebrations, including sermons and addresses, and lessons in Sunday schools and day schools, were held in some hundreds of towns and villages all over the country.

The success of Health Week in getting hold of the people had been extraordinary. It had proved its value too unmistakably to be allowed to drop. Professor Bostock Hill had asked him to express his conviction that Health Week would do more to solve the housing problem and to check tuberculosis and infant mortality than any other agency. The question was: who should carry it on? Should it be guided by capable and experienced hands or left to others?

The Agenda Club had already carried through two Health Weeks to a successful issue, but were not in a position to undertake the direction of future celebrations. The Royal Sanitary Institute, on the other hand, was founded for the express purpose of promoting the advancement of sanitary science, and diffusing knowledge relating thereto. With its long and honourable record, its assured position, and its four thousand members drawn from all the health-promoting professions, it was emphatically *the* representative health association of the Empire. Its success in promoting sanitary science and in bringing together official and unofficial workers for health had been unqualified. It had hitherto devoted itself mainly to that branch of its work, and had hardly as yet bestowed so much attention on the diffusion of knowledge among the masses of the people. But the one duty was no less important than the other. The urgency of the need for securing the interest and co-operation of the public in matters of health was recognised on all hands.

The principle of Health Week had already been endorsed by the Institute. The Brighton Congress in 1909 recorded its opinion "that the prevailing ignorance in questions of personal and public health was a grave national danger." At the Congress held at Belfast in the ensuing year the following resolution was adopted:—"That this Congress heartily approves of a National Health Week for the purpose of directing public attention to the more pressing health problems of the day and arousing a general sense of responsibility."

Health Week had amply proved its utility and passed beyond the experimental stage. Had not the time arrived for the Institute to acknowledge its offspring, and make the necessary provision for its future?

COUNCILLOR J. G. SMALL (Nottingham) stated that the experience of Nottingham had been that the Health Week was an unqualified success. They had had the co-operation of churches, Sunday schools, the Education Committee, the Public Elementary Schools, and the Chamber of Commerce. He believed The Royal Sanitary Institute was the body most fitted to carry on the work, and he proposed the resolution: "That the Council of The Royal Sanitary Institute be asked to undertake the organisation of the Health Week in order that the movement may be conducted on sound lines."

MR. A. J. MARTIN formally seconded the resolution.

THE MAYOR OF DARLINGTON (Ald. W. J. Stewart) said that in his town Health Week had been carried out by means of voluntary subscriptions. Services were held in all the churches, and the Mayor and Corporation attended the parish church. Health questions were dealt with in Sunday schools, and meetings were arranged at all the guilds and mothers' meetings. Public meetings were arranged every night in a large hall, leaflets were distributed, and dinner-hour meetings at factories and works were arranged. The total cost was £30.

ALDERMAN S. COOK (Nottingham) said that he believed that if The Royal Sanitary Institute would take the matter in hand, incalculable good would result from the work being properly organised. Education was the keynote of the Institute; education by means of the Congresses and publications. There was now an opportunity for the Institute to come into closer touch with the greater outside public.

DR. LECHMERE ANDERSON (Doncaster) said that in his town they had a Baby Show which aroused great interest; they also had 3,000 essays sent in by school children. He thought it would be good to keep it in the hands of the Agenda Club for a little longer.

DR. A. H. BYGOTT (West Suffolk) spoke as a member of the Agenda Club Committee. They wished to hand over the work as a good going

concern so that they could take up something else. The Health Week afforded a valuable excuse for the beginning of educational work by the medical officers of health.

Dr. F. E. Fremantle (Herts C.C.) said he was a member of the Health Week Committee, and he could speak also as a delegate from the National League for Physical Education and Improvement. The Royal Sanitary Institute worked largely with and through officers of official bodies. The question was: should the National League undertake the work, or should The Royal Sanitary Institute, which was in direct touch with local authorities. The work, presumably, would not be confined to members of the body that undertook the organising of the Health Week. The National League would be at a disadvantage if that burden were thrown upon them, as voluntary effort was not as efficient as official municipal effort. The Royal Sanitary Institute, which was chiefly a body of official representatives, was the body to undertake the work. One point to commend that resolution: the more active members of local authorities might be inclined to look askance at the movement from a business point of view, but those business members of local authorities would welcome the management under the business-like methods of The Royal Sanitary Institute.

Alderman Julyan (Poole) said that in Poole the adult schools and other organisations took up Health Week very well. The practical result was that public opinion had been aroused, and sufficient pressure brought to bear on the Council to appoint a School Nurse. He expressed the hope that the resolution would be passed, and that they would do all they could in this great work of education.

Councillor A. Harford (Liverpool) said that they had had an Anti-Tuberculosis Exhibition in Liverpool, which was crowded every night. It appeared to him that the organisers of the Congress at Exeter were well qualified to carry on the work.

Councillor Melluish (Marylebone) said that the adoption of Health Week had been of very great benefit to the borough. He had seen great improvements in the infant mortality rate. He supported the resolution, because under the auspices of The Royal Sanitary Institute better direction could be given to local authorities in conducting this work.

The resolution was put to the meeting and carried unanimously.

NOTES ON LEGISLATION AND LAW CASES.

These notes are copied by permission from The Law Reports published by The Incorporated Council of Law Reporting for England and Wales.
For full text of these see Law Reports, which can be referred to in the Library of the Institute.

OFFENSIVE TRADE.—*Order of Local Authority, declaring Trade offensive—Business established before order—Public Health Act, 1875 (38 & 39 Vict., c. 55), s. 112—Public Health Acts Amendment Act, 1907 (7 Edw. 7, c. 53), s. 51.*

By s. 112 of the Public Health Act, 1875, "Any person who, after the passing of this Act, establishes within the district of an Urban Authority, without their consent in writing, any offensive trade; that is to say the trade of" (then followed six specified trades) "or any other noxious or offensive trade, business, or manufacture, shall be liable to a penalty not exceeding £50, in respect of the establishment thereof, and any person carrying on a business so established shall be liable to a penalty not exceeding 40s. for every day on which the offence is continued." By s. 51 of the Public Health Acts Amendment Act, 1907, "the words, 'any other trade, business, or manufacture, which the local authority declare by order confirmed by the Local Government Board, and published in such manner as the Board direct, to be an offensive trade,' shall be substituted for the words, 'any other noxious or offensive trade, business, or manufacture,' in Section 112 of the Public Health Act, 1875":—

Held, that it is not an offence to carry on a business (not being one of the six offensive trades specified in the section) which has been declared by order of the local authority to be an offensive trade, where the business was established before the coming into operation of the order declaring it to be an offensive trade.

BUTCHERS' HIDE, SKIN, AND WOOL COMPANY, LTD., *v.* SEACOME. Div. Ct. 401, K.B. Vol. II. July, 1913.

COMBINED DRAIN.—*"Sewer"—Liability to repair—Group of houses drained by combined operation, departure from approved plan—Reinstatement—Metropolis Management Act, 1855 (18 and 19 Vict., c. 120), ss. 83, 85, 250.*

A local authority made an order for the drainage of a group of houses by combined operation, as shown on an approved plan. The builder, in carrying out the work, wrongfully connected with the combined drain the drains from two houses outside the group, thereby causing a pipe passing under one of the houses in the group, which had been purchased by the respondents without notice of the builders' wrongful act, to become a sewer within the definition of s. 250 of the Metropolis Management Act, 1855, as between the local authority

and the respondents. Subsequently the local authority served on the builder a notice, under s. 83 of the Act of 1855, requiring him to reinstate the drainage of the group of houses in accordance with the plan originally approved, and on his default in complying with the notice the local authority themselves did the work. After the completion of the work a nuisance existed from the defective condition of the pipe under the respondents' house, which carried off the drainage from the group of houses:—

Held, by Ridley and Avory, J.J., Pickford, J. dissenting, that at the date when the work of reinstating the combined drainage as originally sanctioned was completed, the pipe ceased to be a sewer repairable by the local authority, and became a drain, and that the respondents were liable, under s. 85 of the Act of 1855, to remedy the nuisance.

Vestry of St. Leonard, Shoreditch v. *Phelan* (1896). I. Q.B. 533, distinguished.

KERSHAW *v.* ALFRED JOHN SMITH & CO., LTD. Div. Ct., 455 K.B. Vol. II. July, 1913.

ADULTERATION.—*Sale of Food—Prosecution by Inspector—Necessity for Inspector to prove his Appointment—Sale of Food and Drugs Act, 1875 (38 and 39 Vict., c. 63), ss. 6, 12, 13, 14, 20.*

The appellant, an inspector appointed under the Sale of Food and Drugs Act, laid an information under s. 6 of the Sale of Food and Drugs Act, 1875, against the respondent for having sold to the prejudice of the purchaser an article of food which was not of the nature, substance, and quality of that demanded. At the hearing of the information the appellant in his evidence stated that his name was "Alexander Ross, and inspector under the Food and Drugs Act," and put in evidence the certificate of the public analyst which was addressed "To Inspector A. Ross." He was not cross-examined or asked to produce his appointment as inspector, When the appellant's case was closed the respondent submitted that it was necessary that the appellant should prove that he was a duly authorised officer, and that, as he had not produced his appointment, the information should be dismissed. The appellant asked for an adjournment to enable him to produce his appointment. The justices were of opinion that it was necessary for the appellant formally to prove his appointment as inspector, and that, having failed to do so, he could not be allowed, after having closed the case, to call further evidence, and they dismissed the information:—

Held, that it was not necessary for the appellant formally to prove that he was an inspector by producing his appointment, and that, as he had given *prima-facie* evidence that he was an inspector, the decision of the justices was wrong.

Semble, per Channell and Avory, JJ., that it was not necessary for the appellant to prove that he was an inspector.

ROSS *v.* HELM, K.B., Vol. III., Part XI. November, 1913, Div. Ct. 462.

GENERAL INDEX TO VOL. XXXIV.

INDEX TO NOTES ON LAW CASES, 1894—1913.

JOURNAL SUPPLEMENT

OF

THE ROYAL SANITARY INSTITUTE.

TRANSACTIONS.—VOL. XXXIV.

1913.

LONDON:
OFFICES OF THE INSTITUTE,
90, BUCKINGHAM PALACE ROAD, S.W.
EDWARD STANFORD, LTD., 12, 13, AND 14, LONG ACRE, W.C.

—

1914.

SUPPLEMENT.

TABLE OF CONTENTS.

Table of Contents (Supplement).

Reviews of Books.

THE ROYAL SANITARY INSTITUTE.

REVIEWS OF BOOKS.

Common-Sense Houses.*

This book is intended more for the layman than the professional engineer and is a handsome volume with many excellent illustrations of the subjects with which it deals. The dwelling house is described from its site to its artificial lighting, and there are chapters on site and aspect, walls and damp-proof courses, the arrangement of the rooms, etc. It also deals with the various forms of water supply, including rain-water and the methods adopted for its purification by filtration, etc. Water supply fittings are explained, as well as details of all "sanitary" arrangements, including drainage. There is a good chapter on dust in the house and its treatment. Domestic animals and household pets are also dealt with, and, indeed, nearly all subjects connected with the question of keeping a house healthy are very well dealt with in this book. The book finishes with an excellent chapter on the various methods of lighting a dwelling house.

It is natural that a work of this description must refer to certain makers of various appliances, but it is in no sense a trade advertisement. The book will serve a very useful purpose, and the price is well within the means of almost everybody interested in the subject. It can be recommended not only to the layman, but as a book of reference to the professional expert. H. P. B.

Lessons in Infant Management.†

This little book is an attempt to outline the teaching on infant management recommended by the Board of Education (in their noteworthy Circular 748) to be given, with that on other subjects, to all girls before leaving the elementary schools. It may be doubted if the teaching is entirely suited to elementary schools, for instance, in Bermondsey or Poplar, except as representing an ideal; but here and there it shows efforts to adapt itself to the poorest class.

With this qualification it may be said without hesitation that the book supplies in admirable form and in only 110 small pages exactly the kind of teaching required for young mothers who can provide the essential needs for their babies. The teaching is orthodox, and yet naturally expressed and most practical. Amongst the more especially admirable chapters may be mentioned those on baby's toilet, baby's basket and its contents, and baby's clothing at three stages: those on vaccination, teething, outing and exercise; and, above all, that on baby's training and habits. The three chapters on baby's ailments deal only with croup, rickets, and infant diarrhœa, and attempt rather too much. The last chapter gives 17 useful recipes. But it is to that admirable Chapter XIII. on training and habits that we would specially call attention. F. E. F.

* Common-Sense Houses, by Spencer Sills, M.S.E., M.R.San.I. 168 pp., 4to. Cassell & Co., Ltd., London and New York. 1912. Price 5s. net.

† Lessons in Infant Management, by Florence Lessels Mather, A.R.San.I. 112 pp. 8vo. London, 1912. Thos. Nelson & Sons, Ltd. Price 1s. 6d.

MEETINGS HELD.

EXETER CONGRESS, JULY 7TH TO 12th, 1913.

A Public Meeting to inaugurate arrangements for the Congress was held in the Guildhall on Friday, January 17th. The Mayor of Exeter (Counc. H. W. Michelmore) presided. There was a large attendance which included:—the Mayoress, the Sheriff (Mr. R. Every), Dr. C. J. Vlieland (ex-Mayor), Mr. T. C. Pring (ex-Sheriff), Mrs. Pring, Sir John Shelley, Sir T. H. Hepburn, the Archdeacon of Exeter, Preb. S. W. E. Bird, Dr. Adkins (County Medical Officer), Dr. Brash (City Medical Officer), Mr. T. Moulding (City Engineer and Surveyor), Mr. A. E. Bonham (Chief Sanitary Inspector), Mr. C. T. Towell (Mayor of Torquay), Dr. Dunlop (Medical Officer of Health, Torquay), Mr. H. A. Garrett (Borough Engineer, Torquay), Lt.-Col. Elkington, R.A.M.C., S. Hutton (Borough Surveyor, Exmouth), Mr. H. Lloyd Parry (Town Clerk of Exeter), Mr. H. Percy Boulnois, M.Inst.C.E. (Chairman of Council of the Institute), Mr. H. D. Searles-Wood, F.R.I.B.A. (Chairman of the Congress Committee), Mr. W. C. Tyndale, M.Inst.C.E. (Chairman of the Exhibition Committee), Mr. E. White Wallis, F.S.S. (Secretary of the Institute).

THE MAYOR, in addressing the meeting, said that The Royal Sanitary Institute was the leading sanitary institute in the world, and held congresses in the colonies as well as one annually in the United Kingdom. It was impossible to exaggerate the importance of the work which the Institute was doing, for upon good sanitary conditions depended not only the life and health of the people, but their morality. The city of Exeter at the time of the last congress had no sewage system at all. Their dear old river Exe was described in words he would not repeat; zymotic diseases were rife; and that most important measure, the Public Health Act, 1875, had not had time to exercise any influence upon the health and sanitation of the community. The whole position could be summarised in one sentence: "The death-rate has been reduced by one-third." Marvellous as had been the advance in those thirty odd years, the local authorities had never been more active than at the present time, and they looked forward with considerable expectation to the Institute's congress in July next. The congress in 1880 received a warm welcome from Exeter, although at that time the city was under a very heavy cloud owing to the failure of the West of England Bank, which seriously impaired the fortunes of many old Exeter families. Now meeting under happier auspices, he felt that with the same cordial co-operation of the county the city would justify its reputation for hospitality. The congress would bring some 1,500 people to Exeter, and it was essential that not only the citizens of Exeter, but the principal residents of Devon should heartily co-operate.

On the motion of the Mayor of Torquay (Mr. C. T. Towell), seconded by Mr. J. Stocker, a Local Committee was formed; and on the motion of Dr. C. J. Vlieland, the Town Clerk (Mr. H. Lloyd Parry), the Medical Officer of Health for the County of Devon (Dr. Geo. Adkins), and the School Medical Officer for Exeter (Dr. P. H. Stirk), were appointed Hon. Local Secretaries for the Congress; and Sir Robert Newman, Bart., and Mr. A. H. Gibbs, Hon. Treasurers.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and for Women Health Visitors and School Nurses have been held at:—

Cape Town, S. Africa, November 29th and 30th, 1912.
Exeter, January 17th and 18th.

At these Examinations 39 candidates presented themselves, and the following were awarded certificates:—

Sanitary Science as applied to Buildings and Public Works.

Bourdas, Arthur Frederick. Holgate, Lewis Dixon.
Jones, Ronald Kelsey.

Women Health Visitors and School Nurses.

Champion, Annie Ellen Cowles. Harman, Mary.
Ewing, Emily Elizabeth. Race, Edith.
Thompson, Mary Elizabeth (Mrs.).

Inspectors of Nuisances.

Barbary, John Ewart Trounce.
Braggins, Arthur Dove.
Challice, George, William.
Cochran, John.
Foster, Ernest.
Kenyon, John.
Knapman, George Arthur.
Loach, Thomas Theophilus.
Marais, Johannes Nicholas.
Morgan, John.
Morris, Andrew Shaw.
Nicholls, John Jeffry.
Tait, Henry Makins.
Trounson, Albert Ernest.
Turner, Frank.

FORTHCOMING MEETINGS.

Sessional Meetings.

London, Tuesday, February 11th, at 7.30 p.m. Discussion on "Standards and Tests for Sewage and Sewage Effluents discharging into Rivers and Streams," to be opened by Samuel Rideal, D.Sc., F.I.C. Colonel T. Walter Harding, D.L., J.P., LL.D., in the Chair.

London, Tuesday, March 11th, at 7.30 p.m. Discussion on "The Milk and Dairies Bill," to be opened by Herbert Jones, L.R.C.S.I., D.P.H., M.O.H., Herefordshire Combined Districts.

Wimbledon, Saturday, April 12th. Discussions will be arranged in three Sections, devoted to Child Study, Engineering and Architecture, and Open Spaces. Visits will be made to Schools, Isolation Hospitals, Sewage Works, Parks and Open Spaces in Wimbledon.

Plymouth, Friday and Saturday, March 14th and 15th.

Stafford, Friday, April 25th, at 7.30 p.m. Discussion on "The Milk and Dairies Bill," to be opened by Geo. Reid, M.D., D.P.H., County Medical Officer of Health, Staffordshire. On Saturday, April 26th, at 10 a.m., a visit to Messrs. Siemens' Electrical Works, followed by a Smoke Demonstration of the efficiency of the ventilation in one of the "Staffordshire" type of schools.

Students' Lectures.

The Fifty-fourth Course of Lectures and Demonstrations for Sanitary Officers will commence on Monday, February 3rd.

Courses of Lectures on School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses, will commence on Monday, February 24th.

Course of Practical Training for Meat Inspectors will commence on Friday, February 14th.

The Special Course on Food and Meat Inspection, arranged for Army Officers and Professional Men, will commence on Monday, April 7th.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors Qualifying for Membership, for Inspectors of Nuisances, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses:—

Preston, Jan. 31st and Feb. 1st.	Scarborough, March 14th and 15th.
Ipswich, March 7th and 8th.	Shrewsbury, „ 28th and 29th.

For Inspectors of Meat and Other Foods:—
Grimsby, February 14th & 15th.

Annual Meeting of Associates.

The Annual Meeting of Associates is fixed for Tuesday, March 18th. Address on "Disinfectants and Disease Prevention," by W. W. West, Chief Sanitary Inspector, Walthamstow.

Popular Lectures.

A Course of Popular Lectures on Health, the Home, Food, Common Diseases, the Consumptive, and Exercise, Rest and Sleep, will be arranged during April. Members, Associates, and others can obtain tickets on application, for which no charge will be made.

Ordinary General Meeting.

The Ordinary General Meeting is fixed for Wednesday, April 23rd, at 4 p.m.

Lecture to the Institute.

Wednesday, April 23rd, at 5 p.m., on "Insect-carried Diseases, and their Prevention," by C. W. Daniels, M.B., M.R.C.S., followed, at 6 p.m., by a Display of Micro-Cinematograph Films.

Congress and Exhibition, 1913.

The Right Hon. Earl Fortescue, K.C.B. (Lord Lieutenant of the County of Devonshire) has consented to act as President of the Twenty-eighth Congress and Exhibition of the Institute, to be held at Exeter by invitation of the City Council from July 7th to 12th, 1913.

A Report of the Public Meeting held at Exeter on January 17th is given on page 2.

Calendar for February and March, 1913.

As far as at present arranged.

Council Meetings are held Monthly on the **Second Tuesday** in each Month, and the Standing Committees in the preceding week.

Exhibition Committee . . **Congress and Editing Committee**	Monday in the week preceding the Council, at 4 p.m. and 5 p.m.
Examination Committee . . **Museum and Library Committee**	Tuesday in the week preceding the Council, at 4 p.m. and 5 p.m.
Special Purposes Committee . **Finance Committee . . .**	Wednesday in the week preceding the Council, at 4 p.m. and 5 p.m.
Parliamentary Committee . .	As occasion requires.

The Parkes Museum is open free, on Mondays 9.30 a.m. to 8 p.m., other days 9.30 a.m. to 5.30 p.m. The Library and Office are closed at 1 p.m. on Saturdays.

Council and Committee Meetings are suspended during August and September, and the Museum and Library are closed on Public Holidays.

FEBRUARY.

3 M. Lecture to Sanitary Officers, at 7 p.m. Sanitary Law, A: Public Health Acts—English, Scotch, and Irish, by A. Wellesley Harris, M.R.C.S., M.O.H., Lewisham.

5 W. Lecture to Sanitary Officers at 7 p.m. Sanitary Law, B: Public Health (London) Act, etc., by A. Wellesley Harris, M.R.C.S., D.P.H.

7 F. Lecture to Sanitary Officers at 7 p.m. Sanitary Law, C: Factory and Workshop Act, etc., by A. Wellesley Harris, M.R.C.S., D.P.H.

8 S. Inspection and Demonstration in the District of Chiswick at 3 p.m. Conducted by J. H. Clarke, Chief Sanitary Inspector, Chiswick.

10 M. Lecture to Sanitary Officers 7 p.m. Duties of a Sanitary Inspector—General A, Outdoor, by A. Wellesley Harris, M.R.C.S., D.P.H.

11 Tu. Demonstration of Book-keeping as carried out in a Sanitary Inspector's Office, at the Public Health Office, Town Hall, Upper St., Islington, N., at 6 p.m., by James R. Leggatt, Supt. Public Health Dept., Borough of Islington.

Sessional Meeting, London, at 7.30 p.m. Discussion on "Eighth Report of The Royal Commission on Sewage Disposal on Standards and Tests for Sewage and Sewage Effluents discharging into Rivers and Streams," to be opened by S. Rideal, D.SC., F.I.C., J.P.

12 W. Inspection and Demonstration at Messrs. E. Cook & Co.'s Soap Works, Bow, E. at 3 p.m.

Lecture to Sanitary Officers at 7 p.m. Duties of a Sanitary Officer—Duties B, Indoor, by A. Wellesley Harris, M.R.C.S., D.P.H.

14 F. Lecture to Sanitary Officers at 7 p.m. Duties of a Sanitary Inspector. Offensive Trades and Trade Nuisances, etc., by A. Wellesley Harris, M.R.C.S., D.P.H.

Lecture—Meat Inspectors' Course, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S.

14 F. / 15 S. Examination for Inspectors of Meat and other Foods—Grimsby.

18 Tu. Lecture to Sanitary Officers, at 7 p.m. Infectious Diseases, by J. Priestley, M.D., D.P.H.

19 W. Inspection and Demonstration in the District of Chiswick, at 3 p.m. Conducted by J. H. Clarke, Chief Sanitary Inspector, Chiswick.

Lecture to Sanitary Officers, at 7 p.m. Methods of Disinfection, by J. Priestley, M.D., D.P.H.

21 F. Lecture to Sanitary Officers at 7 p.m. Water: Composition, Pollution and Purification, by J. Priestley, M.D., D.P.H.

22 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m.
Inspection and Demonstration at the Lambeth Disinfecting Station, at 2.30 p.m. Conducted by J. Priestley, M.D., D.P.H.

24 M. Lecture to Sanitary Officers at 7 p.m. Elementary Statistics, by J. Priestley, M.D., D.P.H.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. General Structure and Functions of the Body, by G. Eric C. Pritchard, M.A., M.D.

26 W. Demonstration on Meteorological Instruments in the Parkes Museum, at 6 p.m., by the Director, E. White Wallis, F.S.S.
Lecture to Sanitary Officers at 7 p.m. Elementary Science: Physics, Chemistry, by A. E. Munby, M.A., F.R.I.B.A.

28 F. Lecture—Meat Inspectors' Course, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S.
Lecture to Sanitary Officers at 7 p.m. Elementary Science: Physics, Chemistry, by A. E. Munby, M.A., F.R.I.B.A.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. Personal Hygiene, by G. Eric C. Pritchard, M.A., M.D.
Examinations—Southampton.

MARCH.

1 S. Examinations—Southampton.
Inspection and Demonstration at the Sewage and Destructor Works, Southall, at 2.30 p.m. Conducted by R. Brown, M.INST.C.E.

3 M. Lecture to Sanitary Officers, at 7 p.m. Elementary Science: Physics, Chemistry, by A. E. Munby, M.A., F.R.I.B.A.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. The Growth and Development of the Child, by G. Eric C. Pritchard, M.A., M.D.

5 W. Inspection and Demonstration in the District of Islington, at 2 p.m. Conducted by James R. Leggatt.
Lecture to Sanitary Officers at 7 p.m. Elementary Science: Physics, Chemistry, by A. E. Munby, M.A., F.R.I.B.A.

7 F. Lecture to Sanitary Officers at 7 p.m. Building Materials, by A. E. Munby, M.A., F.R.I.B.A.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. Physical Development, by J. Kerr, M.A., M.D., D.P.H.

7 F. }
8 S. } Examinations—Ipswich.

8 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m.
Inspection and Demonstration at the Sewage and Destructor Works, Ealing, a 2.15 p.m. Conducted by C. Jones, M.INST.C.E., Borough Engineer and Surveyor.

10 M. }
11 Tu. } **Johannesburg.** Second Congress of the South African Branch. Particulars can be obtained from Prof. A E Snape, South African College,
12 W. } Cape Town.

11 Tu. **Sessional Meeting,** LONDON, at 7.30 p.m. Discussion on "The Milk and Dairies Bill," to be opened by Herbert Jones, L.R.C.S.I., D.P.H.

14 F. }
15 S. } **Sessional Meeting,** PLYMOUTH.

18 Tu. **Annual Meeting of Associates.** Address on "Disinfectants and Disease Prevention," by W. W. West, Chief Sanitary Inspector, Walthamstow.

APRIL.

12 S. **Sessional Meeting,** WIMBLEDON.

23 W. **Ordinary General Meeting,** at 4 p.m.
Lecture to the Institute at 5 p.m., on "Insect-carried Diseases, and their prevention," by C. H. Daniels, M.B., M.R.C.S., followed at 6 p.m. by a display of Micro-Cinematograph Films

25 F. } **Sessional Meeting,** STAFFORD. Discussion on "The Milk and Dairies Bill,"
26 S. } to be opened by Geo. Reid, M.D., D.P.H., County Medical Officer of Health, Staffordshire. On Saturday, April 26th, at 10 a.m., visit to Messrs. Siemens' Electrical Works, followed by a Smoke Demonstration of the efficiency of the ventilation in one of the "Staffordshire" type of schools.

JULY.

7-12. **Congress and Exhibition,** EXETER. President: The Right Hon. Earl Fortescue, K.C.B. (Lord Lieutenant of Devonshire).

LIST OF MEMBERS AND ASSOCIATES

ELECTED JANUARY, 1913.

MEMBERS.

M Marked thus have passed the Examination of the Institute for Inspectors of Meat and Other Foods.
‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.
§ Marked thus have passed the Institute's Examination for Sanitary Surveyors (India).
* Marked thus have passed the Examination of the Institute in Sanitary Science as applied to Buildings and Public Works.

Reg. No.	Date of Election.	
3358	1913. Jan.	ASHKENNY, Armly, B.SC.(P.H.) EDIN., M.B., CH.B. EDIN., (*Asst. S.M.O.*), 38, *George Road, Edgbaston, Birmingham.*
3373	1913. Jan.	§BALWANT, Narhar, *Sanitary Inspector, Nagpur, C.P., India.*
3359	1913. Jan.	BOUSFIELD, Leonard, M.A., M.D.CANTAB., M.R.C.S., L.R.C.P., D.P.H., (*M.O.H.*), 36, *Nevern Square, S.W.* (*Medical Officer of Health, Khartoum.*)
3374	1913. Jan.	*M*BUXTON, Frank Grant, M.R.C.V.S., 15, *Jackson's Lane, Highgate, N.*
3385	1913. Jan.	CAMPBELL, Charles, 82, *Norbury Crescent, Norbury, S.W.*
3360	1913. Jan.	CROWHURST, James William, F.R.C.V.S., 141, *Longmarket Street, Cape Town, South Africa.*
3361	1913. Jan.	DAVIES, John Philip Henry, M.R.C.S., L.R.C.P., D.P.H., *City of London Hospital, Victoria Park, E.*
3362	1913. Jan.	DURRAN, David, M.B., C.M., D.P.H., (*M.O.H.*), *Mina Villa, Thurso, Scotland.*
3363	1913. Jan.	FITZMAURICE, Sir Maurice, C.M.G., M.INST.C.E., *Westminster Chambers*, 9, *Victoria Street, S.W.*
3375	1913. Jan.	*GOSLING, Percy Frederick, 160, *Copleston Road, East Dulwich, S.E.*
3376	1913. Jan.	‡*GRAY, Frederick R., *Council Offices, Trinity Road, Sheerness-on-Sea.*
3377	1913. Jan.	*JAGTAP, Balkrishna Piraji, L.C.E., 120, *Victoria Street, Westminster, S.W.*
3364	1913. Jan.	*M*‡LARARD, Samuel, 9, *Coram Street, Holborn, W.C.*
3365	1913. Jan.	‡LAWSON, Robert, *Babbly House, Heliopolis, Cairo, Egypt.*
3378	1913. Jan.	*MASTERS, Rev. Walter E., D.D., F.Z.S., *Harley House, Underhill Road, Dulwich, S.E.*
3366	1913. Jan.	MCHATTIE, Alexander Campbell Nicholson, M.B. EDIN., D.P.H., D.T.M.& H.CAMB., (*M.O.H.*), *Chief Medical Officer, Nassau, Bahamas, West Indies.*
3367	1913. Jan.	MITRA, Manmatha Nath, L.M.S., D.P.H.LOND., D.T.M. LIVERP., *Nabha, Punjab, India.*
3368	1913. Jan.	MITRA, Narendra Kumar, B.SC.(ENG.)GLASG., 59, *Beadon Street, Calcutta, India.* (21, *Havelock St., Glasgow.*)
3369	1913. Jan.	OWEN, Oswald, A.M.INST.C.E., 5, *Belgrave Terrace, South Shields.*

3379 1913. Jan. §PATEL, Chhotabhai J., *Changa, via Nadiad, Gujarat, India.*

3380 1913. Jan. ‡*REES, Griffith John, *High Street, Ystalyfera, Glam.*

3370 1913. Jan. ROZDON, S., D.P.H., L.R.C.S., L.R.C.P.EDIN., (*M.O.H.*), *Health Dept., Amritsar, Punjab, India.*

3381 1913. Jan. §SANJANA, Bomon S., 16, *Trebovir Road, Earl's Court, S.W.*

3371 1913. Jan. STURGESS, George, A.M.INST.M.&C.E., *Borough Surveyor's Dept., Town Hall, Chelsea, S.W.*

3372 1913. Jan. TOMORY, David Morice, M.B., C.M., D.P.H., (*M.O.H.*), *Medical Officer of Health, Bloemfontein, S. Africa.*

3382 1913. Jan. *WEEKS, Edred, "*Tollington*," *Beatrice Road, New Oxted, Surrey.*

3383 1913. Jan. ‡*WHITE, Arthur, *Quarter-Master-Sergt. R.E., Bulford Camp, Wilts.*

3384 1913. Jan. *WORTLEY, Robert Kendal, 13, *Oriental Place, Brighton.*

ASSOCIATES.

‡ **Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.**

V **Marked thus have passed the Examination for Women Health Visitors and School Nurses.**

S **Marked thus have passed the Examination of the Institute in School Hygiene, including Elementary Physiology.**

M **Marked thus have passed the Examination of the Institute for Inspectors of Meat and Other Foods.**

6002 1913. Jan. ‡BLACK, James, *Staff-Sergt. R.A.M.C., Depot, Royal Army Medical Corps, Aldershot.*

6003 1913. Jan. ‡BLACKFORD, George Henry, 30, *Blatchington Road, Hove.*

6004 1913. Jan. ‡BLEAKLEY, Ralph, *Public Health Dept., Invercargill, Southland, New Zealand.*

6005 1913. Jan. ‡BOOTHROYD, Miss Florrie, 46, *Royds Street, Tottington, Bury.*

6006 1913. Jan. ‡BOX, Allan Cyril, *Ford Farm, Ashford, Middlesex.*

6007 1913. Jan. ‡BRAKE, John Francis Eustace, 19, *Leinster Avenue, East Sheen.*

6008 1913. Jan. *V*BUCKELL, Miss Mary Frances, 8, *Downs Road, Beckenham.*

6009 1913. Jan. ‡BURTON, Thomas Fowler, *Hillside, Duton Hill, Dunmow, Essex.*

6010 1913. Jan. ‡BYARD, Miss Amy, *Hopkinson House, Vincent Square, S.W.*

6011 1913. Jan. ‡CHAPMAN, Ebenezer John Juler, *The Freehold, Hadlow, Tonbridge.*

6012 1913. Jan. ‡CLAYTON, Arthur, 18, *Richmond Terrace, Whitchurch, Salop.*

6013 1913. Jan. *V*CLARKSON, Miss Mary, 30, *Tugs Road, Wakefield.*

6014 1913. Jan. ‡CONNOLLY, Robert George, 22, *St. Mary Road, Walthamstow.*

6015 1913. Jan. ‡CUTTING, William Alexander, *Gas Works, Haverhill, Suffolk.*

6016 1913. Jan. ‡Davies, David, *Lance-Corpl. R.A.M.C., Depot, Royal Army Medical Corps, Aldershot.*
6017 1913. Jan. ‡Dobson, William Harper, 4, *Park Avenue, Gillingham, Kent.*
6018 1913. Jan. √Dunlop, Miss Edith Marianne, 64, *South Audley Street, W.*
6019 1913. Jan. ‡Eden, Thomas, *Church Street, Audley, Staffs.*
6020 1913. Jan. ‡Empsall, Stanley, 15, *All Saints Place, Stamford.*
6021 1913. Jan. ‡Ensor, William Henry, *Glanrhyd, Malltraeth, Dodorgan R.S.O., Anglesey.*
6056 1913. Jan. ‡Fairclough, W. Harold, 119, *Chester Road, Sunderland.*
6022 1913. Jan. ‡Feaster, Robert, *South Cottage, Skirlaugh, near Hull.*
6023 1913. Jan. ‡France, Charles Harold, *Health Officer, Wigan.*
6024 1913. Jan. ‡Green, Joseph Alexander, *Home Farm, Prestbury, near Cheltenham.*
6057 1913. Jan. ‡Guest, Charles, *Vernon Lodge, Blacker Hill, Barnsley.*
6025 1913. Jan. ‡Hagues, John, 6, *Ridley Road, Willesden, N.W.*
6026 1913. Jan. ‡Hodgson, Ernest William, 8, *St. Edward's Road, Gosport.*
6027 1913. Jan. ‡Holman, Miss Annie Marguerite, 19, *Oxford Road, Worthing.*
6028 1913. Jan. √Jones, Miss Winifred, 61, *Angus Road, Roath Park, Cardiff.*
6029 1913. Jan. ‡Kedgley, Harry James, *Welton Cottage, Stanway, Colchester.*
6030 1913. Jan. ‡Keene, Frank, 46, *King's Rd., Kingston-on-Thames.*
6031 1913. Jan. ‡Lovelock, Harry W., 54, *Blandford Road, Beckenham.*
6032 1913. Jan. sLyne, Miss Evelyn Woodyeare, 10, *Nevern Road, Earl's Court, S.W.*
6033 1913. Jan. ‡McClure, Samuel, 22, *Park Road, Consett, Co. Durham.*
6034 1913. Jan. ‡Mackintosh, William Robert, 88, *Burghley Road, Tufnell Park, N.*
6035 1913. Jan. ‡Macmillan, Miss Jessie Cameron, *Sanitary Department, Town Hall, Oxford.*
6036 1913. Jan. ‡Mellor, Leonard, 154, *Westgate, Wakefield.*
6037 1913. Jan. ‡Morris, William Davies, 13, *Torwerth Street, Machynlleth, Montgomeryshire.*
6038 1913. Jan. ‡Newman, Henry John, "*Camdenville,*" 31, *Port Hall Road, Brighton.*
6039 1913. Jan. MNixon, Henry Kinnersley, 27, *Enkel Street, Holloway, N.*
6040 1913. Jan. ‡Oakey, Archibald William, *County Health Department*, 33, *Bowling Green Street, Leicester.*
6041 1913. Jan. ‡Parkins, Miss Annetta, 61, *Mexfield Road, East Putney, S.W.*
6042 1913. Jan. ‡Parry-Hughes, John, *Bryn Tirion, Coed Pella Road, Colwyn Bay.*

6043 1913. Jan. ‡PERKINS, Miss Emma Read, *c/o Dr. Perkins, 37, Harley Street, W.*
6044 1913. Jan. ‡RAIMES, Christopher, 21, *Albury Road, Jesmond, Newcastle-on-Tyne.*
6045 1913. Jan. ‡RATTRAY, John, 9, *Albert Terrace, Margate.*
6046 1913. Jan. sRICHARDSON, Miss Augusta Florence, 7, *Frederick Terrace, Denmark Hill, S.E.*
6047 1913. Jan. ‡ROBSON, Gilbert, 4, *Roseworth Crescent, Gosforth, Newcastle-on-Tyne.*
6048 1913. Jan. ‡SHEARD, Gustavus William, "*Wayside,*" *Hextable, Swanley, Kent.*
6049 1913. Jan. ‡SMITH, Fred., *Louth Street, Caistor, Lincs.*
6050 1913. Jan. vSPEAK, Miss Jessie, "*Vinoria,*" *Bishop Auckland, Co. Durham.*
6051 1913. Jan. ‡TAYLER, Harry, 29, *Grosvenor Street, Hull.*
6052 1913. Jan. vTHORPE, Miss Lydia Beatrice, *Upton St. Leonards, Gloucester.*
6053 1913. Jan. ‡WATERFALL, Frank, *High Cliff, North Wingfield, near Chesterfield.*
6054 1913. Jan. ‡WHEELER, Edwin Owen, *West Mersea, Colchester.*
6055 1913. Jan. ‡WHEELER, Harold E., 55, *Lawford Road, Camden Road, N.W.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY.

JANUARY, 1913.

*** *For Publications of Societies and Institutions, etc., see under "Academies."*

ACADEMIES (ENGLISH).

London. *Auctioneers and Estate Agents' Institute of the United Kingdom.* Annual Record, Vol. II., Part II. 32 pp., 8vo. London, 1912. *The Institute.*

——— *Institution of Municipal and County Engineers.* Proceedings, Vol. XXXVIII., 1911–12. 514 pp., 8vo. London, 1912. *The Institution.*

——— *Surveyors' Institution.* Transactions, Session 1912–13, Vol. XLV., Part III. 85 pp., 8vo. London, 1912. *The Institution.*

ACADEMIES (COLONIAL AND FOREIGN).

New York. *American Society of Civil Engineers.* Transactions, Vol. LXXV. 1,215 pp., 8vo. New York, 1912. *The Society.*

——— *Canadian Association for the Prevention of Tuberculosis.* Twelfth Annual Report. 316 pp., 8vo. Toronto, 1912. *The Association.*

Collie, *A., M.D.* Smallpox and its Diffusion. 58 pp., 8vo. Bristol, 1912. *The Publishers (John Wright & Sons, Ltd.).*

Dunn, *James S.* Methods of To-day. 11 pp., 8vo. Kimberley, 1912. *The Author.*

Feldman, *W. M., M.B., M.R.C.S.* A Manual of Nursery Hygiene. 168 pp., 8vo. London, 1912. *The Publishers (Baillière, Tindall & Cox).*

Hoffman, *F. L.* Rural Health and Welfare; with special reference to New England, New York, New Jersey, and Pennsylvania. 16 pp., 8vo. Newark, N.J., 1912. *The Author.*

Leipzig. Zweiundvierzigster Jahresbericht des Königl. Landes-Medizinal-Kollegiums über das Medizinalwesen im Königreich Sachsen auf das Jahr 1910. 432 pp., 8vo. Leipzig, 1912. *Dr. Renk.*

Local Government Board. Minutes of Evidence taken before the Departmental Committee to inquire and report with regard to the use of Intercepting Traps in House Drains. 204 pp., fcp. London, 1912. *The Board.*

MEDICAL OFFICERS OF HEALTH AND OTHER SANITARY REPORTS.

Aberdeen, City of, October and November, 1912 .. .. .. *Matthew Hay, M.D.*
Boston, City of (U.S.A.), 1911 .. *Thomas B. Shea, M.D.*
Cornwall C.C., November, 1912 .. *Robert Burnet, M.B., D.P.H.*
Huddersfield, 3rd Quarter, 1912 .. *S. G. Moore, M.D., D.P.H.*
Kimberley, Sanitary Inspector, 1911 *James S. Dunn.*
Leeds, City of, 1911 .. .. .. *J. Spottiswoode Cameron, M.D., B.Sc.*
Montreal, City of, 1911 .. .. *Louis Laberge, M.D.*
Norfolk C.C., 1911 .. .. .. *J. T. C. Nash, M.D., D.P.H.*
Sydney, Metropolitan Combined Sanitary Districts, 1911 .. .. *W. G. Armstrong, M.B., D.P.H.*

New York. Joint Board of Sanitary Control in the Cloak, Suit and Skirt Industry. Second Annual Report, 1912. 23 pp., 8vo. New York, 1912. *The Board.*

Redgrove, *H. S., B.Sc., F.C.S.* Experimental Mensuration. 328 pp., 8vo. London, 1912. *The Publisher (Wm. Heinemann).*

"Sanitary Record." Year Book and Diary for 1913. 136 pp., 8vo. London, 1912. *The Sanitary Publishing Co., Ltd.*

Seaton, *E. C., M.D., F.R.C.P.* Infectious Diseases and their Preventive Treatment. 214 pp., 8vo. London, 1911. . *The Author.*

GENERAL AND COLONIAL NOTES.

Western Australian Branch.

A Public Health Congress was held at Perth from the 1st to 4th October, 1912, in the organisation of which the Western Australian Branch took a prominent part. The other bodies participating were the British Medical Association, the Australian Army Medical Corps, the Australian Trained Nurses' Association, the Western Australian Institute of Architects, the Western Australian Institute of Engineers, and the Education Department.

Dr. James W. Hope, Commissioner of Public Health, was the President of the Congress, Mr. F. J. Huelin was the Honorary Secretary and Treasurer, and His Excellency the Governor, extended his patronage to the Congress.

The meetings were held in the Lecture Hall of the new buildings of the Department of Public Health, Perth, and visits of inspection were made to various sanitary works and private undertakings.

The Congress was opened by His Excellency the Governor (Sir Gerald Strickland, K.C.M.G.), and among those present were the Premier of the State, the Honorary Minister, and the Mayor of Perth.

The subjects set down for discussion included Foods and Food Supply; City Development, Housing, Transport; Public Health Principles; Military Hygiene; and Children and Child Life. Special Conferences of Inspectors and of Local Health Authorities were arranged, and at the close of the Congress a paper was read on "Moth infestation of Potato Tubers in relation to Public Hygiene."

The Western Australian Branch is to be congratulated on its share in promoting this important Congress, the first of its kind to be held in the Commonwealth of Australia, and it must be a matter of much satisfaction to all those concerned in the organisation of the Congress that it resulted in such a successful meeting.

It has been arranged to print the proceedings of the Congress, and copies will be obtainable in a few weeks' time from Mr. Huelin, Central Board of Health, Perth.

The Annual Meeting of the Branch was held on December 14th, 1912, at Perth.

A formal message from the Council was read, congratulating the Members and Associates of the Branch on the completion of the third year's work in Western Australia, and expressing the hope that the Branch may continue and increase its useful work.

The following officers were elected for the ensuing year:—President: David Ernest Williams, L.R.C.P.I., L.R.C.S.I., L.M. Vice-Presidents: R. C. E. Atkinson, M.A., M.B., Ch.B., D.P.H.; S. S. Dougall, F.I.C.; F. W. Lawson, Assoc.M.Inst.C.E.; R. M. Mitchell, M.B., F.R.C.S., D.P.H.; H. Rowley, F.C.S.; W. P. Seed, M.R.C.S., L.R.C.P. Secretary and Treasurer: F. J. Huelin.

The Statement of Receipts and Expenditure and Balance Sheet for the year was presented and accepted.

New Zealand Branch.

A notice has been received from the Hon. Secretary of the New Zealand Branch of the death by accident while on duty of John Thomas Hopkins, Associate of the Institute.

Mr. Hopkins was an Inspector acting under the authority of the Department of Public Health of the Dominion, and he met his death on December 6th by falling from a ladder into the hold of a vessel at Wellington which he had been instructed to fumigate.

Mr. Hopkins showed a great interest in the work of the Institute in New Zealand, and the Hon. Local Secretary of the Centre attended the funeral as the representative of the Institute.

South African Branch Congress, 1913.

The Second Congress of the South African Branch of the Institute is to be held in Johannesburg, March 10th–12th. Many offers of papers have been received, and it is hoped that a large number of local authorities of the Union will send official delegates to the meeting. Full particulars can be obtained from the Hon. Secretary of the Branch, Prof. A. E. Snape, Assoc.M.Inst.C.E., South African College, Cape Town.

THE ROYAL SANITARY INSTITUTE.

REVIEWS OF BOOKS.

WATER BACTERIOLOGY IN THE TROPICS.*

The author has had considerable experience in water examination in India when acting as Sanitary Commissioner in Madras, and of late years in Calcutta. He has done well to record his results and the conclusions to which he has been led, for the benefit of other workers in the same field. There are many difficulties to be surmounted in this branch of bacteriology in the tropics. Major Clemesha probably does not himself feel that he has reached finality in his results: they are, however, well worthy of publication. The bacteriology of human and animal excreta is first dealt with, after which the author considers the prevalence and significance of streptococci and glucose fermenters in water, the action of sunlight on fæcal organisms and on the bacterial content of waters freely exposed thereto in the tropics; and, finally, a summary is given of researches on the waters of Indian lakes and rivers. Professor Clemesha shows that the sun has a very powerful action in destroying fæcal organisms in water, particularly when they are "naked," and not surrounded by intestinal mucus; but that these fæcal organisms vary in their power of resistance, and may be divided into those that are very susceptible, *i.e.*, easily killed (such as *B. coli*); those that can resist for a considerable time, such as the Grunthal bacillus and *B. cloacæ*; and an intermediate group. From this it results that the detection of *B. coli communis* represents undesirable (because comparatively recent) pollution: other signs pointing to recent pollution are probable presence of 3, 4, or 5 different kinds of bacilli; nearness of the acid and gas line in glucose and lactose broth; possibility of finding streptococci in the water; and scarcity of *B. lactis aërogenes*. The author considers that a good lake water should contain less than 100 colonies per cc. (agar at 37° C.): this seems an unduly high limit, as lakes act as sedimentation reservoirs, and even in India may be of remarkable bacterial purity. The characters of a badly-contaminated water are stated as:—presence of streptococci in 20 cc.; acid and gas line in glucose and lactose broth the same; usually, but not invariably, the presence of some member of the susceptible group (*B. coli*, etc.); absence, or great rarity, of *B. lactis aërogenes*. Detailed description is given of the author's technique, which makes the book valuable to all laboratory workers in the tropics. The book is well printed: *aërogenes* appears as *ærogenes* throughout, which cannot therefore be put down as an error of the press.

A. M. D.

LEAD POISONING AND LEAD ABSORPTION.†

Lead is used in many important manufacturing industries, *e.g.*, in the making of white lead, in pottery glazing, in glass polishing, in the handling of printing

* The Bacteriology of Surface Waters in the Tropics. By W. W. Clemesha, M.D., D.P.H., Major I.M.S.; Sanitary Commissioner, Bengal; Professor of Hygiene, Medical College, Calcutta. 161 pp. Calcutta, 1912: Thacker, Spink, and Co. London: E. and F. N. Spon. Price, rupees 7.8 or 10s.

† Lead Poisoning and Lead Absorption: the Symptoms, Pathology, and Prevention. By Thomas M. Legge, M.D.; and K. W. Goadby, M.R.C.S., D.P.H. 308 pp., 8vo. London, 1912. Edward Arnold. Price 12s. 6d.

type, in litho making, in house, coach, and motor-car painting, in the manufacture of paints and colours, in file making, in tinning of metals, etc. A very large industrial population is exposed to the risks of lead poisoning, and many of the workers suffer in health from the absorption of lead into their systems. Fortunately, lead poisoning is less prevalent than it was; and this is due partly to improved processes by which the more insoluble preparations of lead are now used in preference to those which are easily absorbed, and partly to modern precautions in works where lead is used, by which injurious dusts are quickly carried away, and the health of the workers is attended to by periodical medical inspections.

The authors are of opinion, as the result of Mr. Goadby's investigations on the experimental production of lead poisoning in animals, that lead dust when inhaled by the lungs is far more dangerous, and produces symptoms of lead poisoning much earlier, than does the direct ingestion of a very much larger quantity of the same lead-containing compound by way of the mouth and gastro-intestinal canal. In other words, a dusty atmosphere containing lead compounds is more dangerous to the workman than the lead adhering to his hands, which may reach his mouth and stomach if he takes his meals without a thorough cleansing of his hands.

The absorption of the finer lead particles gaining access to the lungs in inhaled dust takes place, the authors conclude, through the medium of the white blood corpuscles, as such cells (phagocyte cells) are quite well known to exist within the air cells of the lung. The lead particles are thence transferred into the finer blood vessels, and so are carried forward into the general circulation, thus inducing the symptoms of lead poisoning. Lead compounds which are swallowed and reach the intestine may be absorbed through the lacteals, and so enter the thoracic duct and the general circulation; but a certain amount of such lead compounds is taken up by the portal circulation and transferred direct to the liver. However absorbed, lead remains stored up in the body in minute quantities in many places, and is only slowly eliminated, very largely through the fæces.

The only disease which the authors regard as being undoubtedly a sequela of long exposure to the effects of lead is chronic Bright's disease, a degenerative disease of the kidneys. This disease, which is very fatal to lead workers, causes five times as many deaths amongst male workers in lead as amongst "all males."

The chapters on the pathology, symptomatology, diagnosis, and treatment of lead poisoning, on the means by which lead is excreted from the body, and on the effects of lead on the nervous system, will be of interest chiefly to medical readers, and will be welcomed as the latest and most reliable contributions to the subject in English medical literature.

Three chapters are devoted to preventive measures against lead poisoning, and contain analyses of atmospheres charged with lead fumes and dust; a description of the different hoods and air-guides used for collecting fumes and dust as generated, and the various systems of exhaust ventilation by fans, etc., which are applicable under different circumstances. The periodical medical examination of workers, the use of overalls and head coverings, meal-room accommodation, and the supply of baths and lavatories all receive due consideration; whilst the last three chapters give a most useful and instructive description of the chief manufacturing processes in which lead is employed, their dangers, and the methods of prevention most suited to each particular process.

L. O. P.

MEETINGS HELD.

London.—The meeting was held at the Institute on Tuesday, February 11th, at 7.30 p.m., when a discussion on "Standards and Tests for Sewage and Sewage Effluents discharging into Rivers and Streams," was opened by Samuel Rideal, D.Sc., F.I.C. The Chair was taken by Colonel T. Walter Harding, D.L., J.P., LL.D.

EXAMINATIONS.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and for Women Health Visitors and School Nurses have been held at:—

Perth, W. Australia, August 8th, 9th and 10th, 1912.
Melbourne, Victoria, November 12th and 14th, 1912.
Brisbane, Queensland, November 16th and 23rd, 1912.
Adelaide, S. Australia, December 3rd and 5th, 1912.
Preston, January 31st and February 1st.

For Inspectors of Meat and other Foods:—

Perth, W. Australia, August 8th, 9th and 10th, 1912.
Grimsby, February 14th and 15th.

At these Examinations 123 candidates presented themselves, and the following were awarded certificates:—

Sanitary Science as applied to Buildings and Public Works.

BALECHE, MICHAEL S.
CATO, CLARENCE MURRELL.
PLANT, CLIFFORD ERNEST.
STEWART, DAVID GEORGE.

Women Health Visitors and School Nurses.

CROMPTON, BERTHA.
HEALD, ESTHER MARY.
THORNBER, SARAH.

Inspectors of Nuisances.

ALLAN, CHARLES WILLIAM.
BAILEY, JOHN GARNETT.
BENNET, RALPH HERBERT.
BINET, JULES.
BIRD, PHILIP WILLIAM KIMBERLEY.
BROSNAN, CORNELIUS.
BROWN, ATHELSTAN WHARTON DODGSON.
BURNUP, JOHN ADAM.
CLOWES, WILLIAM HOWARD.
COHN, WALTER JULIUS.
COWEN, HERBERT STEWART.
CURTIS, ALFRED FREDERICK.
DAWSON, CHARLES JOSEPH.
DEAN, ARNOLD.
DENMEAD, CHARLES EDMUND.
EASSIE, CHARLES JAMES.
EASSIE, NORMAN LECK.
EDWARDS, THOMAS.
GIBBONS, JOHN WILLIAM.
HAMILTON, JAMES INGLIS.
JEFFREY, HERBERT TOWNLEY.
JORDAN, THOMAS GEORGE ORR.
KIRTON, JOHN HENRY BISHOP.
LENNOX, PERCIVAL GILBERT.
LOWE, GEORGE LAWRENCE.
LOWE, WILLIAM RAYMOND.
MCCONDRIE, ROBERT WILLIAM HENRY CHRISTOPHER.
MCNEIL, WILLIAM.
MARSHALL, ALEXANDER ROSS.
MARSHALL, J. C.
MARTIN, GEORGE HARRISON.
MELLIS, JAMES WILLIAM.
MORGANS, HERBERT.
PEIRCE, WILLIAM JOHN RUEBEN.
PRIDHAM, ALFRED.
REILLY, FRANCIS JOHN.
RICHARDSON, WILLIAM.
ROBINSON, CHARLES WALTER.

*

SCOTT, JAMES FRANCIS.
SILVERWOOD, FRANK HARRIS.
WHITE, WILLIAM JAMES.
WHITLOCK, GEORGE.
WHITTAKER, SELBY.
WIGLEY, HENRY VANDELEUR.
WOOD, EDGAR THOMAS.

Inspectors of Meat and other Foods.

BERRY, WILLIAM HENRY.
ELLISON, GEORGE.
EVANS, DAVID ARTHUR.
GANDELL, JAMES ARTHUR.
GRIMSHAW, LUTHER.
HALL, ARTHUR EDWARD.

FORTHCOMING MEETINGS.

SESSIONAL MEETINGS.

London, Tuesday, March 11th, at 7.30 p.m. Discussion on "The Milk and Dairies Bill," to be opened by Herbert Jones, L.R.C.S.I., D.P.H., M.O.H., Herefordshire Combined Districts.

Wimbledon, Saturday, April 12th, at 10.30 a.m. Discussions will be arranged: "Environment in relation to Disease," by Elwin H. T. Nash, M.R.C.S., D.P.H., M.O.H. Wimbledon; "Infant Consultation, its aims and limitations," by Beatrice McGregor, M.B., C.M.; "Open Spaces Policy in its local aspect," by Mr. Richardson Evans; and "Desirability of Open Spaces along the Wandle," by Miss Parton. Visits will be made to Schools, Isolation Hospitals, Sewage Works, Parks and Open Spaces in Wimbledon.

Plymouth, Friday, March 14th, at 7 p.m., in the Western Law Courts, Guildhall. Discussions on "Our Milk Supply," by W. J. Addiscott, Chief Sanitary Inspector, Plymouth; and "The Water Supply of Devonport," by F. W. Lillicrap, Water Engineer, Devonport.

On Saturday, March 15th, at 10.30 a.m., visits will be made to the Electricity Works and Burrator Water Works.

Stafford, Friday, April 25th, at 7.30 p.m. Discussion on "The Milk and Dairies Bill," to be opened by Geo. Reid, M.D., D.P.H., County Medical Officer of Health, Staffordshire.

On Saturday, April 26th, at 10 a.m., a visit to Messrs. Siemens' Electrical Works, followed by a Smoke Demonstration of the efficiency of the ventilation in one of the "Staffordshire" type of schools. The members will be entertained at Luncheon by the Mayor and Town Council.

Cheltenham, Friday, May 16th, at 7.30 p.m., in the Town Hall. Discussion on "Aids and Hindrances to the present day effort to Diminish Tuberculosis," to be opened by J. H. Garrett, M.D., D.P.H., M.O.H., Cheltenham, and J. Middleton Martin, M.D., D.P.H., M.O.H., County of Gloucester.

On Saturday, May 17th, the members will be entertained by W. N. Skillicorne, J.P. (Chairman of the Public Health Committee and Ex-Mayor), and visits will be made to municipal undertakings and places of interest in the town.

Chester, Friday, May 30th, at 7 p.m., and Saturday, May 31st.

ANNUAL MEETING OF ASSOCIATES.

The Annual Meeting of Associates is fixed for Tuesday, March 18th. at 7 p.m. Address on "Disinfectants and Disease Prevention," by W. W. West, Chief Sanitary Inspector, Walthamstow.

Ordinary General Meeting.

The Ordinary General Meeting is fixed for Wednesday, April 23rd, at 4 p.m.

Lecture to the Institute.

Wednesday, April 23rd, at 5 p.m., on "Insect-carried Diseases, and their Prevention," by C. W. Daniels, M.B., M.R.C.S., followed, at 6 p.m., by a Display of Micro-Cinematograph Films. Sir William J. Collins, D.L., J.P., M.D., F.R.C.S. (Vice-President), in the chair.

Popular Lectures.

Popular Lectures will be given at the Institute during April and May. Members, Associates, and others can obtain tickets on application, for which no charge will be made.

Tuesday, April 1st, at 7 p.m.: "Personal Health,"
By the Hon. Sir John A. Cockburn, M.D., K.C.M.G.

Tuesday, April 8th, at 7 p.m.: "The Home,"
By Professor H. R. Kenwood, M.B., D.P.H., F.R.S.E.

Tuesday, April 15th, at 7 p.m.: "Food,"
By Lt.-Col. W. W. O. Beveridge, D.S.O., M.B., D.P.H., R.A.M.C.

Tuesday, April 22nd, at 7 p.m.: "Common Diseases,"
By Philip Boobbyer, M.D., M.S.

Tuesday, April 29th, at 7 p.m.: "The Consumptive,"
By J. E. Squire, C.B., M.D., F.R.C.P.

Tuesday, May 6th, at 7 p.m.: "Exercise, Rest, and Sleep,"
By Leonard Hill, M.B., F.R.S.

Students' Lectures.

The Special Course on Food and Meat Inspection, arranged for Army Officers and Professional Men, will commence on Monday, April 7th.

Building Trades Exhibition, Olympia.

A visit has been arranged to this Exhibition on Saturday, April 19th, at the invitation of Mr. H. Greville Montgomery, who will entertain the members at tea. Those wishing to attend should send in their names to the Secretary of the Institute by April 12th, when tickets to admit them to the Exhibition will be forwarded.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors Qualifying for Membership, for Inspectors of Nuisances, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses:—

Ipswich, March 7th and 8th.	Bristol, April 4th and 5th.
Scarborough, March 14th and 15th.	Edinburgh, April 11th and 12th.
Shrewsbury, „ 28th and 29th.	Manchester, „ 18th and 19th.

For Smoke Inspectors:—Manchester, April 18th and 19th.

For Inspectors of Meat and Other Foods:—
Manchester, April 25th and 26th.

THE TWENTY-EIGHTH CONGRESS OF THE INSTITUTE WILL BE HELD IN EXETER FROM JULY 7TH TO 12TH, 1913.

PRESIDENT.

THE RIGHT HON. EARL FORTESCUE, K.C.B.
(LORD LIEUTENANT OF DEVONSHIRE).

CHAIRMAN OF LOCAL COMMITTEE.

THE RIGHT WORSHIPFUL THE MAYOR OF EXETER.

Officers of Sections and Conferences.

A—Sanitary Science and Preventive Medicine.

President: A. WYNTER BLYTH, M.R.C.S., F.I.C., F.C.S.
Recording Secretary: CHARLES PORTER, M.D., B.Sc., M.O.H., St. Marylebone.

B—Engineering and Architecture.

President: H. PERCY BOULNOIS, M.Inst.C.E., Late Deputy Chief Engineering Inspector, Local Government Board.
Recording Secretary: A. SAXON SNELL, F.R.I.B.A., 9, Bentinck Street, Manchester Square, W.

C—Domestic Hygiene.

President: THE MAYORESS OF EXETER (Mrs. MICHELMORE).
Recording Secretary:

D—Hygiene of Infancy and Child Study.

President: E. J. DOMVILLE, M.R.C.S., J.P.
Recording Secretary: F. E. FREMANTLE, M.A., M.B., F.R.C.P., County Medical Officer of Health, Hertford.

I.—Municipal Representatives.

President:—THE RIGHT WORSHIPFUL THE MAYOR OF EXETER.
Recording Secretary: H. LLOYD PARRY, Town Clerk, Exeter.

II.—Medical Officers of Health.

President: GEORGE REID, M.D., D.P.H., County Medical Officer of Health, Staffordshire.
Recording Secretary: A. WELLESLEY HARRIS, M.R.C.S., D.P.H., M.O.H., Lewisham.

III.—Engineers and Surveyors.

President: THOMAS MOULDING, M.Inst.C.E., City Engineer, Exeter.
Recording Secretary: JOHN S. BRODIE, M.Inst.C.E., Borough Engineer, Blackpool.

IV.—Veterinary Inspectors.

President:
Recording Secretary: J. A. DIXON, M.R.C.V.S., Veterinary Inspector, Leeds.

V.—Sanitary Inspectors.

President: JAMES ROBINSON, County Health Inspector, Durham C.C.
Recording Secretary: W. J. ADDISCOTT, Chief Inspector of Nuisances, Plymouth.

The Health Exhibition will be held in the Victoria Hall from July 5th to 12th.

CALENDAR FOR MARCH AND APRIL, 1913.

As far as at present arranged.

MARCH.

1 S. Examinations—Southampton.
Inspection and Demonstration at the Sewage and Destructor Works, Southall, at 2.30 p.m. Conducted by R. Brown, M.INST.C.E.

3 M. Lecture to Sanitary Officers, at 7 p.m. Elementary Science: Physics, Chemistry, by A. E. Munby, M.A., F.R.I.B.A.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. The Growth and Development of the Child, by G. Eric C. Pritchard, M.A., M.D.

4 Tu. Lecture to Sanitary Officers at 7 p.m. Water: Composition, Pollution, and Purification, by J. Priestley, M.D., D.P.H.

5 W. Inspection and Demonstration in the District of Islington, at 2 p.m. Conducted by James R. Leggatt.
Lecture to Sanitary Officers at 7 p.m. Elementary Science: Physics, Chemistry, by A. E. Munby, M.A., F.R.I.B.A.

7 F. Lecture to Sanitary Officers at 7 p.m. Building Materials, by A. E. Munby, M.A., F.R.I.B.A.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. Physical Development, by J. Kerr, M.A., M.D., D.P.H.

7 F. }
8 S. } Examinations—Ipswich.

8 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m.
Inspection and Demonstration at the Sewage and Destructor Works, Ealing, at 2.15 p.m. Conducted by C. Jones, M.INST.C.E., Borough Engineer and Surveyor.

10 M. }
11 Tu. } **Johannesburg.** Second Congress of the South African Branch. Particulars can be obtained from Prof. A. E. Snape, South African College,
12 W. } Cape Town.

10 M. Lecture to Sanitary Officers at 7 p.m. Building Sites, by A. E. Munby, M.A., F.R.I.B.A.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. Physical Conditions, by J. Kerr, M.A., M.D., D.P.H.

11 Tu. **Sessional Meeting,** LONDON, at 7.30 p.m. Discussion on "The Milk and Dairies Bill," to be opened by Herbert Jones, L.R.C.S.I., D.P.H.

12 W. Inspection and Demonstration at L.C.C. Lodging House, Kemble Street, Drury Lane, W.C., at 2.30 p.m.
Lecture to Sanitary Officers, at 7 p.m. Ventilation, Warming, and Lighting, by A. E. Munby, M.A., F.R.I.B.A.

14 F. Lecture—Meat Inspectors' Course, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S.
Lecture to Sanitary Officers, at 7 p.m. Details of Plumbers' Work, by A. Herring-Shaw.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. School Buildings, by J. Osborne Smith, F.R.I.B.A.

14 F. }
15 S. } Examinations—Scarborough.

14 F. }
15 S. } **Sessional Meeting,** PLYMOUTH, at 7 p.m., in the Western Law Courts, Guildhall. Discussions on "Our Milk Supply," by W. J. Addiscott, Chief Sanitary Inspector, Plymouth; and "Water Supply of Devonport," by F. W. Lillicrap, Water Engineer, Devonport. On Saturday, March 15th, visits will be made to Electrical Power Works and Burrator Water Works.

15 S. Demonstration—School Hygiene and Health Visitors' Course, at 2.30 p.m., to Secondary and Elementary Schools, by J. Osborne Smith, F.R.I.B.A.

17 M. Lecture on School Hygiene and for Health Visitors, at 7 p.m. Food and Clothing, by A. Beresford Kingsford, M.D., D.P.H.
Lecture to Sanitary Officers, at 7 p.m. Calculations, Measurements, and Plans and Sections, by W. C. Tyndale, M.INST.C.E.

18 Tu. **Annual Meeting of Associates,** at 7 p.m. Address on "Disinfection and Disease Prevention," by W. W. West, Chief Sanitary Inspector, Walthamstow.

19 W. Inspection and Demonstration in the District of Islington, at 2 p.m. (number limited). Conducted by James R. Leggatt.
Lecture to Sanitary Officers, at 7 p.m. Sanitary Appliances, by W. C. Tyndale, M.INST.C.E.

26 W. Lecture to Sanitary Officers, at 7 p.m. House Drainage, by F. Osborne Smith, F.R.I.B.A.

28 F. Lecture—Meat Inspectors' Course, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. Elements of Home Nursing, by Miss C. Barker.
Lecture to Sanitary Officers, at 7 p.m. Sewerage, by Henry C. Adams, ASSOC.M.INST.C.E.

28 F. }
29 S. } Examinations—Shrewsbury.

29 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m.

31 M. Lecture on School Hygiene and for Health Visitors at 7 p.m. Care of Infants and Young Children, by Miss C. Barker.
Lecture to Sanitary Officers at 7 p.m. Sewage Disposal, by Henry C. Adams, ASSOC.M.INST.C.E.

APRIL.

1 Tu. **Popular Lecture,** at 7 p.m. "Personal Health," by The Hon. Sir John A. Cockburn, M.D., K.C.M.G.

2 W. Inspection and Demonstration in the District of Islington, at 2 p.m. (number limited). Conducted by James R. Leggatt.
Lecture to Sanitary Officers, at 7 p.m. Water Supply, by Henry C. Adams, ASSOC.M.INST.C.E.

4 F. Lecture on School Hygiene and for Health Visitors, at 7 p.m. Infant Feeding, by A. Beresford Kingsford, M.D., D.P.H.
Lecture to Sanitary Officers, at 7 p.m. Scavenging, Disposal of House Refuse, by Henry C. Adams, ASSOC.M.INST.C.E.

4 F. }
5 S. } Examinations—Bristol.

5 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m.
Inspection and Demonstration at the Addington Waterworks, at 2.30 p.m. Conducted by Henry C. Adams, ASSOC.M.INST.C.E.

7 M. Introductory Lecture to Commissioned Officers and Professional Men, at 4 p.m., by Col. J. Lane Notter, M.D., R.A.M.C.
Lecture to Sanitary Officers at 7 p.m. Signs of Health and Disease in Animals Destined for Food, by W. Hunting, F.R.C.V.S.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. First Aid, by A. Beresford Kingsford, M.D., D.P.H.

8 Tu. Demonstration to Commissioned Officers and Professional Men, at Smithfield Market, at 11 a.m.
Lecture to Commissioned Officers and Professional Men, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S.
Popular Lecture, at 7 p.m. "The Home," by Prof. Henry R. Kenwood, M.B., D.P.H., F.R.S.E.

9 W. Inspection and Demonstration at Messrs. Tickler's Jam and Messrs. Otto Mönsted's Margarine Factories, Southall, at 2.30 p.m.
Lecture to Sanitary Officers, at 7 p.m. The Names and Situations of the Organs of the Body in Animals, by W. Hunting, F.R.C.V.S.

12 S. **Sessional Meeting,** WIMBLEDON, at 10.30 a.m. Discussions on "Environment in relation to Disease," by Elwin H. T. Nash, M.R.C.S., D.P.H., M.O.H. Wimbledon; "Infant Consultation, its aims and limitations," by Beatrice McGregor, M.B., C.M.; "Open Spaces Policy in its local aspect," by Mr. Richardson Evans; and "Desirability of Open Spaces along the Wandle," by Miss Parton.

19 S. **Visit to Building Trades Exhibition, Olympia.** Members and Associates wishing to attend should apply to Institute for tickets by April 12th.

23 W. **Ordinary General Meeting,** at 4 p.m.
Lecture to the Institute at 5 p.m., on "Insect-carried Diseases, and their prevention," by C. H. Daniels, M.B., M.R.C.S., followed at 6 p.m. by a display of Micro-Cinematograph Films.

25 F. }
26 S. } **Sessional Meeting,** STAFFORD. Discussion on "The Milk and Dairies Bill" to be opened by Geo. Reid, M.D., D.P.H., County Medical Officer of Health, Staffordshire. On Saturday, April 26th, at 10 a.m., visit to Messrs. Siemens' Electrical Works, followed by a Smoke Demonstration of the efficiency of the ventilation in one of the "Staffordshire" type of schools.

JULY.

7-12. **Congress and Exhibition,** EXETER. President: The Right Hon. Earl Fortescue, K.C.B. (Lord Lieutenant of Devonshire).

LIST OF MEMBERS AND ASSOCIATES

ELECTED FEBRUARY, 1913.

MEMBERS.

§ Marked thus have passed the Institute's Examination for Sanitary Surveyors (India).

*** Marked thus have passed the Examination in Sanitary Science as applied to Buildings and Public Works.**

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

Reg. No.	Date of Election.	
3386	1913. Feb.	ATKINSON, Reginald Cyril Everitt, M.A.(N.Z.), M.B., CH.B.(EDIN.), D.P.H.(CAMB.), *Deputy Commissioner of Public Health, Perth, W. Australia.*
3400	1913. Feb.	§BHAT, V. J. Bhavnagar, *Kathiawar, India.*
3401	1913. Feb.	*BOURDAS, Arthur Frederick, 3, *Nightingale Lane, Clapham Common, S.W.*
3387	1913. Feb.	COUSTON, Benjamin Bagley, *Jetty Street, Dunedin, Zealand.*
3402	1913. Feb.	§DAVE, Shrivshankar V., *Health Officer, Junagad, Bombay Presidency, India.*
3403	1913. Feb.	*‡DENMARK, Herbert S., *P.O. Box 383, Strathcona, Alberta, Canada.*
3388	1913. Feb.	‡EDWARDS, John Herbert, 9, *Talbot Road, Wrexham, Denbighs.*
3404	1913. Feb.	*GALLOWAY, William, *Beach Road, Devonport, Auckland, New Zealand.*
3389	1913. Feb.	GRIFFIN, John Vernon, *Indian Public Works Dept., Rangoon, Burma.*
3390	1913. Feb.	HINKS, Edward, B.SC., F.I.C. (*Public Analyst*), *Analytical Laboratory*, 16, *Southwark Street, S.E.*
3405	1913. Feb.	*HOLGATE, Lewis Dixon, *Sewage Works, Tiverton, Devon.*
3391	1913. Feb.	HUXBY, William Sherrin, LIC.R.I.B.A., M.S.A., *Asst. Government Architect, Kuala Lumpur, Federated Malay States.*
3392	1913. Feb.	JOHNSTON, John, M.D., C.M.. D.P.H., *Public Health Dept., Queen Street, Melbourne.*
3406	1913. Feb.	*KELSEY-JONES, Ronald, 166, *Oakwood Court, Kensington, W.*
3393	1913. Feb.	KUNWAR, Har Pratap Singh, B.SC.(ENG.)GLASG., *Victoria*, 1, *Woodend Drive, Jordanhill, Glasgow.*
3394	1913. Feb.	LE SOUEF, E. A., B.V.S.C.MELB., *Director, Zoological Gardens, South Perth, Western Australia.*
3395	1913. Feb.	LOOMBA, Kundan Lal, B.SC.ENG.(LOND.), B.A.(PUNJAB), *c/o Messrs. Taylor and Wallin, Cathedral Buildings, Newcastle-on-Tyne.*
3396	1913. Feb.	LOW, Norman Kwong Ten, B.E.(N.Z.), 13, *Scotland Street, Dunedin, New Zealand.*

3397 1913. Feb. Lowe, Arthur Hamilton, M.B., C.M., D.P.H., (*M.O.H.*), 84, *Harrowby Road, Grantham, Lincs.*

3407 1913. Feb. §Nusserwanji, Framroze, *79th Street, Mandalay Upper Burma.*

3398 1913. Feb. ‡Shelley, William Lincoln, P.A.S.I., 34, *Angles Road, Streatham, S.W.*

3408 1913. Feb. *Stewart, D. G., *Inspector, Health Dept., Perth, Western Australia.*

3399 1913. Feb. Williams, Edward Colston, M.D., B.S., F.R.C.S., 46, *Torrington Square, W.C.* (*Medical Asst., L.C.C., Public Health Dept.*)

ASSOCIATES.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

S Marked thus have passed the Examination in School Hygiene, including Elementary Physiology.

V Marked thus have passed the Examination of the Institute for Women Health Visitors and School Nurses.

M Marked thus have passed the Examination of the Institute for Inspectors of Meat and Other Foods.

Reg. No. Date of Election.

6058 1913. Feb. Brook, Miss Emmeline Leonora, 38, *Durley Road, Stamford Hill, N.*

6059 1913. Feb. Hamilton, J. B., *Sunnyside Cottage, Camelon, Falkirk.*

6060 1913. Feb. ‡Bennet, Ralph Herbert, *Sanitary Inspector, Meekatharra, W. Australia.*

6061 1913. Feb. ‡Binet, Jules, 216, *Piesse Street, Boulder, W. Australia.*

6062 1913. Feb. ‡Cargeeg, Raymond Arthur, *Town Clerk, &c., South Perth, W. Australia.*

6063 1913. Feb. S Cattley, Miss Dorothy, 15, *Park Grove, York.*

6064 1913. Feb. ‡Challice, George W., 69, *Sidwell Street, Exeter.*

6065 1913. Feb. ‡Cohn, Walter Julius, *Town Clerk, &c., Victoria Park, W. Australia.*

6066 1913. Feb. V Cowen, Miss Emily Mary, 238, *Westgate Road, Newcastle-upon-Tyne.*

6067 1913. Feb. ‡Davies, George William, 9, *Gladstone Street, Belleknowe, Dunedin, New Zealand.*

6068 1913. Feb. ‡Dow, William, *Dept. of Public Health, Perth, W. Australia.*

6069 1913. Feb. ‡Downie, Sydney, *Inspector, Cottesloe Beach, W. Australia.*

6070 1913. Feb. ‡Evans, David Arthur, 30, *Davis Street, Boulder, W. Australia.*

6091 1913. Feb. Firmin, Miss Lizzie, 835, *Broadway West, Vancouver, British Columbia.*

6071 1913. Feb. ‡Foote, A. W., *Food Inspector, Winnipeg, Manitoba, Canada.*

6072 1913. Feb. ‡Griffiths, Gwilym, 70, *Brithweunydd Rd., Trealaw, Rhondda.*

6073 1913. Feb. v HARMAN, Miss Mary, 7, *Hatcher Street, Dawlish, Devon.*
6074 1913. Feb. ‡HONOUR, Walter Henry, *Sanitary Surveyor, Napier, Hawkes Bay, New Zealand.*
6075 1913. Feb. ‡HOWARD, Thomas Walter, *Dept. of Public Health, Perth, W. Australia.*
6076 1913. Feb. M‡INGLETON, William, *Patrington U.D.C., Hull.*
6077 1913. Feb. ‡KNAPMAN, George Arthur, 80, *Durnford Street, E. Stonehouse, Devon.*
6082 1913. Feb. ‡LORD, John Fredk., 13, *Much Park Street, Coventry.*
6078 1913. Feb. M MINES, Geo. Robert, 693, *William Avenue, Winnipeg, Canada.*
6079 1913. Feb. ‡NICHOLLS, John Jeffry, *Eastdon, Starcross, Devon.*
6080 1913. Feb. ‡PALMER, William John, 23, *Annandale Street, Annandale, Sydney, New South Wales.*
6081 1913. Feb. v RACE, Miss Edith, 9, *Hill Crest, Saltash, Cornwall.*
6082 1913. Feb. M RIGBY, Arthur, *Dairy Inspector, Winnipeg, Canada.*
6083 1913. Feb. ‡RODDAM, Miss Margaret, 4, *Cardigan Terrace, Newcastle-upon-Tyne.*
6084 1913. Feb. ‡TAYLOR, Reginald George Nelson, *Knowle, Brentry, near Bristol.*
6085 1913. Feb. v THOMPSON, Mrs. Mary Elizabeth, 16, *Alderney Road, Globe Road, Mile End, E.*
6086 1913. Feb. ‡TROLLOPE, Stanley, 52A, *Northcote Road, Norwich.*
6087 1913. Feb. ‡TURNER, Frank, *Fore Street, St. Maurice, Plympton, Devon.*
6088 1913. Feb. ‡WATSON, Thomas M., 16, *Victoria Street, Luton.*
6089 1913. Feb. ‡WHITE, Charles, 4, *St. George's Road, Gillingham, Kent.*
6090 1913. Feb. ‡WRIGHT, John Ruddock, 15, *Newcomen Terrace, Redcar, Yorks.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY.

JANUARY, 1913.

*** *For publications of Societies and Institutions, etc., see under "Academies."*

ACADEMIES (BRITISH).

London. *Concrete Institute.* Transactions and Notes. Vol. IV., Part III. 97 pp., 8vo. London, 1912. *The Institute.*

——— *Institution of Civil Engineers.* Minutes of Proceedings. Vol. CXC. 476 pp., 8vo. London, 1912. *The Institution.*

ACADEMY (FOREIGN).

Philadelphia. *American Climatological Association.* Transactions. Vol. XXVIII., 1912. 347 pp., 8vo. Philadelphia, 1912. *The Association.*

Canada, Dominion of. Reports, Returns, and Statistics of Inland Revenues for the Year ended March 31st, 1912. Part I.: Excise. Part II.: Weights and Measures, Gas and Electricity. Part III.: Adulteration of Food. 309 pp., 8vo. Ottawa, 1912. *W. B. Nantel (Minister of Inland Revenue).*

England and Wales, Registrar-General for. Census, 1911. Vol. 1; Administrative Areas; Vol. 2: Registration Areas; Vol. 3: Parliamentary Areas; Vol. 4: Ecclesiastical Areas. London, 1912.
Bernard Mallett, C.B. (*Registrar-General*).

Fisher, *Irving, Ph.D.* A Revised Estimate of the Economic Cost of Tuberculosis. 19 pp., 8vo. *The Author.*

Local Government Board. Dr. W. W. E. Fletcher's Report upon the Sanitary Circumstances and Administration of the East Stow Rural District. New Series, No. 75. 11 pp., 8vo. London, 1912.
A. Newsholme, C.B., M.D., F.R.C.P.

MEDICAL OFFICERS OF HEALTH AND OTHER SANITARY REPORTS.

Cornwall C.C., December, 1912 ..	*Robert Burnet, M.D., D.P.H.*
Dundee School Board, 1911–1912 ..	*A. E. Kidd, M.B., D.P.H.*
Johannesburg, 1st July, 1911—30th June, 1912..	*Charles Porter, M.D., D.P.H.*
Lowestoft, 1911	*A. Marshall, D.P.H.*
Massachusetts State Board of Health, 1911	*Mark W Richardson, M.D.*
Michigan State Board of Health, 1911	*F. W. Shumway, M.D.*
Salford, 1911	*C. H. Tattersall, L.R.C.P., M.R.C.S.*

New South Wales. Second Report of the Government Bureau of Microbiology, dealing with work performed during the Years 1910–1911. 244 pp., fcp. Sydney, 1912. *F. T. Tidswell, M.B., D.P.H., Director.*

Ontario, Province of. Report Relating to the Registration of Births, Marriages, and Deaths for 1911. 159 pp., 8vo. Toronto, 1912.
W. A. Hanna (*Registrar-General*).

Scotland, Registrar-General for. Report of the Twelfth Decennial Census. Vol. V. Part 24: County of Lanark. Part 26: County of Nairn. Part 27: County of Orkney. Part 28: County of Peebles. Part 29: County of Perth. Part 30: County of Renfrew. Part 31: County of Ross and Cromarty. Part 32: County of Roxburgh. Fcp. London, 1912.
J. Patten Macdougall (*Registrar-General*).

United States Bureau of Labour, Washington. Report on Care of Tuberculous Wage Earners in Germany. 183 pp., 8vo. Washington, 1912.
The Bureau.

GENERAL NOTES.

An International Building Trades Exhibition is to be held at Leipzig from May to the end of October this year, and the Authorities have extended to the Institute a very cordial invitation to pay a visit to the Exhibition, assuring the members that they will welcome them with exceptional pleasure.

The object of the Exhibition is to give a comprehensive survey of the progress made in matters concerning public buildings and dwellings in all civilized countries, and there will be special sections devoted to Garden Suburbs, Horticulture, Interior Decoration of the Home, etc.

If a wish is expressed on behalf of a number of members to pay a visit to the Exhibition, the Council will consider the possibility of arranging a formal visit.

THE ROYAL SANITARY INSTITUTE.

REVIEWS OF BOOKS.

Records of London Wells.*

This memoir, the preparation of which must have taken much time and labour, gives an account of all known wells and borings for water in the London district; at all events but few wells can have escaped the watchful eyes of Mr. Barrow.

There are many Londons, of various shapes and sizes, from the small tract originally so-called (the City of to-day) to the large one so well ruled by the Metropolitan Police. But now we have another London added; and that is the district covered by the six-inch Ordnance Maps of London; a highly artificial affair, but probably more convenient for the authors, as having definite straight-lined boundaries.

The "Strata penetrated by the Wells," ranging from the Recent Peat and Alluvium down to the Old Red Sandstone, are described, and various kinds of wells, in 9 pages. The waters found have 4 pages given to them; the relation of water supply to geological structure has 3 pages; and the fall in the water level and in the yield another 3. The areas of highest and lowest supply are treated in over 4 pages; and so also is the Croydon Bourne, which, by the way, is again going.

The reinforcement of underground water by pouring filtered river-water down into the Thanet Sand is alluded to, and the Palæozoic Floor under London is noticed.

Having thus got through 33 pages of more or less readable matter, the reader is then overwhelmed with a mass of details, beginning with a Catalogue of Published London Wells, with a short description of each, some additional notes, and a reference to the work wherein published. This is arranged by counties, the City being treated as a separate county, and carries us down to p. 90.

Then comes the main body of the work, a description of new wells, including a few old ones about which much additional information has been got. This, also arranged by counties, fills pages 91–210, and is a great addition to our knowledge of wells and water-supply.

The plates are: a map of the contours in the underground water-surface, a map of the contours of the Chalk-surface, and a record of rainfall and water-level in the Croydon district (really of the Bourne) from 1902 to 1912.

To conclude, with the only detrimental remark that one can fairly make on this valuable work of reference, the index, of little more than 4 pages, might have been fuller.

W. W.

* Records of London Wells, by G. Barrow, F.G.S., and L. J. Wills, M.A., F.G.S. Memoirs of the Geological Survey. 214 pp., 8vo. London, 1913. Price 4s. 6d.

Water Supply and Drainage.*

The title of this little book might mislead the unwary, as the book bristles with formulæ and rather formidable equations.

It is an attempt to systematise the preparation of a water supply or sewerage scheme by a proper condition of the hydraulic gradients of the entire system, and in this respect might be exceedingly useful; but the engineer would have to weave into his calculations the local circumstances surrounding each case. The tables and "curves" are, however, exceedingly useful for reference by an engineer. H. P. B.

NOTES OF BOOKS.

Notes on Meat and Food Inspection.†

This little book, arranged as a pocket remembrancer, gives useful notes under the headings of the cow, the ox, the horse, the sheep, fish, fowl, and rabbits; characteristics of flesh of diseased or unwholesome meat; points to notice in the slaughter-house; the weights of joints and organs; and the law and duties of inspectors in meat and food inspection.

MEETINGS HELD.

Sessional Meetings.

London.—The meeting was held at the Institute on Tuesday, March 11th, at 7.30 p.m., when a discussion on "The Milk and Dairies Bill" was opened by Herbert Jones, L.R.C.S.I., D.P.H., M.O.H. The Chair was taken by A. Wynter Blyth, M.R.C.S., F.I.C., F.C.S. (Vice-President).

Plymouth.—The meeting was held in the Guildhall on Friday, March 14th, at 7 p.m. Discussions on "Our Milk Supply" were opened by W. J. Addiscott, Chief Sanitary Inspector, Plymouth, and "The Water Supply of Devonport," by F. W. Lillicrap, Water Engineer, Devonport. The Chair was taken by Col. J. Lane Notter, M.A., M.D., R.A.M.C. On Saturday, March 15th, a visit was made to the Electricity Works.

Associates and Students' Meeting.

London.—The meeting was held at the Institute on Tuesday, March 18th, at 7 p.m., when a discussion on "Disinfectants and Disease Prevention" was opened by W. W. West, Chief Sanitary Inspector, Walthamstow. The Chair was taken by Louis C. Parkes, M.D., M.R.C.S., D.P.H.

* Water Supply and Drainage, systematised and simplified by C. E. Housden. 28 pp., 8vo. London, 1912. Longmans, Green, and Co. Price 1s. 6d.

† Notes on Meat and Food Inspection, by John T. Cowderoy, Chief Sanitary Inspector, Borough of Kidderminster. 58 pp., 8vo. Kidderminster, 1912. T. Brooks. Price 2s.

EXAMINATIONS.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses have been held at:—

Auckland, N.Z., December 12th and 13th, 1912.
Sydney, N.S.W., December 19th and 21st, 1912.
Southampton, February 28th and March 1st, 1913.
Ipswich, March 7th and 8th.
Scarborough, March 14th and 15th.

At these Examinations 113 candidates presented themselves, and the following were awarded certificates:—

Sanitary Science as applied to Buildings and Public Works.

PAULL, HAROLD.
SHIPLEY, GEORGE WILLIAM.
STEWART, HERBERT.
WILLIAMS, WILLIAM HOWARD.

Women Health Visitors and School Nurses.

GRIERSON-JACKSON, ETHEL MAUD DOROTHY.
PENTY, ELLEN.
SHAW, GERTRUDE POWELL.
SHIELDS, HILDA KATE.

School Hygiene, including Elementary Physiology.

BUTTERY, WILLIAM.
LOCK, ROBERT.
LONDALE, FLORENCE JOYCE.

Inspectors of Nuisances.

BAILEY, PETER GEORGE.
BARRASS, SAMUEL.
BLOCK, CICELY LAVINIA.
BRUSH, ROBERT SYDNEY.
BURGESS, GEORGE DANIEL.
CANE, IRENE.
CARD, LOUISE ALICE.
CATCHPOLE, FRANK BERNARD.
CRIPPS, HARRY.
CUNNINGHAM, CECIL HERBERT.
DENNY, JAMES SYDNEY.
DERRY, WILLIAM.
DOIG, HERBERT S.
DRABBLE, JOSEPH.
DRUMMOND, WILLIAM ALEXANDER.
DUMBRELL, ALFRED.
EGAN, THOMAS.
HOLMES, ALFRED STEPHENSON.
HOLMES, ROBERT.
HUGHES, MICHAEL FREDERICK.
HUTCHINSON, JAMES.
KILPATRICK, JAMES ALEXANDER WILLIAM.
KING, ALFRED.
MEARS, ALFRED THOMAS.
MEGENEY, RONALD R. J.
NASH, FREDERICK CHARLES.
PAIGE, MABEL EVELYN.
PEARCE, WILLIAM HENRY.
PLOWRIGHT, ARTHUR WILLIAM.
PRESTON, FANNY.
RAWDON, JOHN WILLIAM.
SARGEANT, SIDNEY HERBERT.
SMITH, WILLIAM BENNIE.
SPRINGHETT, WILLIAM SUTTON.
STEELE, ARTHUR HENRY HAMERTON.
STEELE, HERBERT.
SUTCLIFFE, JOHN.
SWALLOW, ELIZABETH.
THOMAS, ROBERT WILLIAM.
WEBB, ALEXANDER.
WELCH, CHARLES ARTHUR.
WENHOLM, SIGFRID WALDEMAR.
WILLS, DAVID EBENEZER.
WILSON, ANNIE.
WORTLEY, HAROLD.

FORTHCOMING MEETINGS.

Sessional Meetings.

Wimbledon, Saturday, April 12th, at 10.30 a.m., in the Pelham Road Schools, discussions on: "Environment in relation to Disease," by Elwin H. T. Nash, M.R.C.S., D.P.H., M.O.H. Wimbledon; "Infant Consultation, its limits and its aims," by Beatrice McGregor, M.B., C.M.; The "Open Spaces Policy and its Local Aspect," by Mr. Richardson Evans; and "Desirability of Open Spaces along the Wandle," by Miss Parton. Visits will be made to Schools, Horticultural Gardens, Parks and Open Spaces in Wimbledon.

Stafford, Friday, April 25th, at 7.30 p.m., in the County Council Buildings. Discussion on "The Milk and Dairies Bill," to be opened by Geo. Reid, M.D., D.P.H., County Medical Officer of Health, Staffordshire.

On Saturday, April 26th, at 10 a.m., a visit to Messrs. Siemens' Electrical Works, followed by a Smoke Demonstration of the efficiency of the ventilation in one of the "Staffordshire" type of schools. The members will be entertained at Luncheon by the Mayor and Town Council.

Cheltenham, Friday, May 16th, at 7.30 p.m., in the Town Hall. Discussion on "Aids and Hindrances to the present-day effort to Diminish Tuberculosis," to be opened by J. H. Garrett, M.D., D.P.H., M.O.H., Cheltenham, and J. Middleton Martin, M.D., D.P.H., County Medical Officer of Health, Gloucester.

On Saturday, May 17th, Visits will be made to Slaughter-houses and Public Abattoir, Destructor, Electric Light Works and Disinfector, Clinic for treatment of school children, and the Pittville Gardens and Cleeve Hill. The members will be entertained by W. N. Skillicorne, J.P. (Chairman of the Public Health Committee and ex-Mayor).

London, Tuesday, May 20th, at 7.30 p.m. Address on "London's Water Supply," by E. B. Barnard, J.P., M.A., Chairman of the Metropolitan Water Board.

Chester, Friday, May 30th, at 7 p.m., and Saturday, May 31st. Discussion on "Methods of Water Purification and Softening," to be opened by J. Parry, M.Inst.C.E., Chief Engineer, Liverpool Waterworks.

On Saturday, May 31st, visits will be made to the Waterworks, etc.

Ordinary General Meeting.

The Ordinary General Meeting is fixed for Wednesday, April 23rd, at 4 p.m.

Lecture to the Institute.

Wednesday, April 23rd, at 5 p.m., on "Insect-carried Diseases, and their Prevention," by C. W. Daniels, M.B., M.R.C.S. Sir William J. Collins, D.L., J.P., M.D., F.R.C.S. (Vice-President), in the chair.

Followed, at 6 p.m., by a Display of Micro-Cinematograph Films.

Popular Lectures.

Popular Lectures will be given at the Institute during April and May. Members, Associates, and others can obtain tickets on application, for which no charge will be made.

Tuesday, April 1st, at 7 p.m.: "Personal Health,"
By the Hon. Sir John A. Cockburn, M.D., K.C.M.G.

Tuesday, April 8th, at 7 p.m.: "The Home,"
By Professor H. R. Kenwood, M.B., D.P.H., F.R.S.E.

Tuesday, April 15th, at 7 p.m.: "Food,"
By Lt.-Col. W. W. O. Beveridge, D.S.O., M.B., D.P.H., R.A.M.C.

Tuesday, April 22nd, at 7 p.m.: "Common Diseases,"
By Philip Boobbyer, M.D., M.S.

Tuesday, April 29th, at 7 p.m.: "The Consumptive,"
By J. E. Squire, C.B., M.D., F.R.C.P.

Tuesday, May 6th, at 7 p.m.: "Exercise, Rest, and Sleep,"
By Leonard Hill, M.B., F.R.S.

Demonstration of Electrical Cooking and Domestic Appliances.

Tuesday, April 8th, at 4 p.m.: Meet at the Museum, and proceed to visit the Electricity Company's Showroom for Demonstration of Electrical Cooking and Domestic Appliances. The Members, and ladies, to whom the Demonstration should be particularly useful, will be entertained to Tea by the Company.

Students' Lectures.

The Special Course on Food and Meat Inspection, arranged for Army Officers and Professional Men, will commence on Monday, April 7th.

Building Trades Exhibition, Olympia.

A visit has been arranged to this Exhibition on Saturday, April 19th, at the invitation of Mr. H. Greville Montgomery, who will entertain the members at tea. Those wishing to attend should send in their names to the Secretary of the Institute by April 12th, when tickets to admit them to the Exhibition will be forwarded.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors Qualifying for Membership, for Inspectors of Nuisances, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses:—

Bristol, April 4th and 5th.	London, May 2nd and 3rd.
Edinburgh, April 11th and 12th.	Belfast, ,, 30th and 31st.

Kimberley, June 27th and 28th.

For Smoke Inspectors:—

Manchester, April 18th and 19th.	London, May 2nd and 3rd.

For Inspectors of Meat and Other Foods:—

Manchester, April 25th and 26th.	London, May 16th and 17th.

Calendar for April and May, 1913.

As far as at present arranged.

APRIL.

1 Tu. **Popular Lecture,** at 7 p.m. "Personal Health," by The Hon. Sir John A. Cockburn, M.D., K.C.M.G.

2 W. Inspection and Demonstration in the District of Islington, at 2 p.m. (number limited). Conducted by James R. Leggatt.
Lecture to Sanitary Officers, at 7 p.m. Water Supply, by Henry C. Adams, ASSOC.M.INST.C.E.

4 F. Lecture on School Hygiene and for Health Visitors, at 7 p.m. Infant Feeding, by A. Beresford Kingsford, M.D., D.P.H.
Lecture to Sanitary Officers, at 7 p.m. Scavenging, Disposal of House Refuse, by Henry C. Adams, ASSOC.M.INST.C.E.

4 F. } 5 S. } Examinations—Bristol.

5 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m.
Inspection and Demonstration at the Addington Waterworks, at 2.30 p.m. Conducted by Henry C. Adams, ASSOC.M.INST.C.E.

7 M. Introductory Lecture to Commissioned Officers and Professional Men, at 4 p.m., by Col. J. Lane Notter, M.D., R.A.M.C.
Lecture to Sanitary Officers at 7 p.m. Signs of Health and Disease in Animals Destined for Food, by W. Hunting, F.R.C.V.S.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. First Aid, by A. Beresford Kingsford, M.D., D.P.H.

8 Tu. Demonstration to Commissioned Officers and Professional Men, at Smithfield Market, at 11 a.m.
Visit to Electric Light Company's Showroom—Demonstration of Electrical Cooking and Domestic Appliances. Meet at the Institute at 4 p.m.
Lecture to Commissioned Officers and Professional Men, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S.
Popular Lecture, at 7 p.m. "The Home," by Prof. Henry R. Kenwood, M.B., D.P.H., F.R.S.E.

9 W. Inspection and Demonstration at Messrs. Tickler's Jam and Messrs. Otto Mönsted's Margarine Factories, Southall, at 2.30 p.m.
Lecture to Sanitary Officers, at 7 p.m. The Names and Situations of the Organs of the Body in Animals, by W. Hunting, F.R.C.V.S.

10 Th. Lecture to Commissioned Officers and Professional Men, at 4 p.m. Alcoholic Beverages, by Colonel J. Lane Notter, M.D., R.A.M.C.
Lecture to Sanitary Officers, at 7 p.m. Practical Methods of Stalling and Slaughtering Animals, by W. Hunting, F.R.C.V.S.

11 F. Demonstration to Commissioned Officers and Professional Men, at Islington Market, at 11 a.m.
Lecture to Commissioned Officers and Professional Men, at 4 p.m. Succulent Vegetables, by Col. J. Lane Notter, M.D., R.A.M.C.
Lecture—Meat Inspectors' Course, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. Communicable Diseases, by E. H. T. Nash, M.R.C.S.

11 F. } 12 S. } Examinations—Edinburgh.

12 S. Inspection and Demonstration at the Morden Hall Farm Dairies, at 2 p.m. Conducted by Oscar J. White.
Sessional Meeting, Wimbledon. Discussions on "Environment and Disease," by Elwin H. T. Nash, M.R.C.S., D.P.H., M.O.H. Wimbledon; "Infant Consultation, its limits and its aims," by Beatrice McGregor, M.D., C.M.; and "Open Spaces," by Mr. Richardson Evans and Miss Parsons.

14 M. Lecture to Commissioned Officers and Professional Men, at 4 p.m. Succulent Vegetables, by Col. J. Lane Notter, M.D., R.A.M.C.
Lecture to Sanitary Officers, at 7 p.m. Diseased Meat, by T. Dunlop Young, M.R.C.V.S.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. Methods of Teaching Hygiene, by Miss Barker.

15 Tu. Inspection and Demonstration at Harrison, Barber & Co., Knackers' Yard, Winthrop Street, Whitechapel, E., at 3 p.m. Conducted by W. Hunting, F.R.C.V.S.
Demonstration to Commissioned Officers and Professional Men, at 11 a.m., at Smithfield Market, by T. Dunlop Young, M.R.C.V.S.
Lecture to Commissioned Officers and Professional Men, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S.
Popular Lecture, at 7 p.m. "Food," by Col. Beveridge, D.S.O., M.B., D.P.H.

16 W. Inspection and Demonstration at a Factory, at 11 a.m., for Commissioned Officers and Professional Men. Conducted by Col. J. Lane Notter, M.D., R.A.M.C.
Lecture to Sanitary Officers, at 7 p.m. Appearance and Character of Fresh Meat, by A. R. Litteljohn, M.R.C.S., M.R.C.V.S.

17 Th. Lecture to Commissioned Officers and Professional Men, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S.

18 F. Demonstration to Commissioned Officers and Professional Men, at 4 p.m., on Sale of Goods, by T. Rule, F.G.I.
Lecture to Sanitary Officers, at 7 p.m. Hygiene of Byres, by A. R. Litteljohn, M.R.C.S., M.R.C.V.S.

18 F. }
19 S. } Examinations—Manchester.

Visit to Building Trades Exhibition, Olympia. Members and Associates wishing to attend should apply for tickets by April 12th.

21 M. Lecture to Sanitary Officers at 7 p.m. Laws, By-laws, by A. R. Litteljohn, M.R.C.S., M.R.C.V.S.

22 Tu. Demonstration at 11 a.m., at Smithfield Meat Market, by T. Dunlop Young, M.R.C.V.S.
Lecture to Commissioned Officers and Professional Men, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S.
Popular Lecture, at 7 p.m. "Common Diseases," by Philip Boobbyer, M.D., D.P.H.

23 W. Demonstration to Commissioned Officers and Professional Men, at 11 a.m., at the Army and Navy Auxiliary Stores.
Demonstration to Commissioned Officers and Professional Men, at 4 p.m. Tea, Coffee, by T. Rule, F.G.I.
Ordinary General Meeting, at 4 p.m.
Lecture to the Institute at 5 p.m., on "Insect-carried Diseases, and their prevention," by C. H. Daniels, M.B., M.R.C.S., followed at 6 p.m. by a display of Micro-Cinematograph Films.

24 Th. Inspection and Demonstration at the Metropolitan Cattle Market, York Road, N., at 2 p.m.

25 F. Demonstration to Commissioned Officers and Professional Men, at Smithfield Market, at 11 a.m., by T. Dunlop Young, M.R.C.V.S.
Lecture to Commissioned Officers and Professional Men, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S.

26 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m.

25 F. }
26 S. } Examination for Inspectors of Meat and other Foods—Manchester.

25 F. }
26 S. } **Sessional Meeting,** STAFFORD. Discussion on "The Milk and Dairies Bill," to be opened by Geo. Reid, M.D., D.P.H., County Medical Officer of Health, Staffordshire. On Saturday, April 26th, at 10 a.m., visit to Messrs. Siemens' Electrical Works, followed by a Smoke Demonstration of the efficiency of the ventilation in one of the "Staffordshire" type of schools.

28 M. Lecture to Commissioned Officers and Professional Men, at 4 p.m. Tinned and Potted Food, by Prof. H. R. Kenwood, M.B., D.P.H.

29 Tu. Demonstration to Commissioned Officers and Professional Men, at 11 a.m., at the Smithfield Meat Market, by T. Dunlop Young, M.R.C.V.S.

Popular Lecture, at 7 p.m. "The Consumptive," by J. E. Squire, M.D., F.R.C.P.

30 W. Demonstration to Commissioned Officers and Professional Men, at 4 p.m. Rice, Arrowroot, etc., by T. Rule, F.G.I.

Lecture to Commissioned Officers and Professional Men, at 7 p.m, by J. R. Hayhurst, M.R.C.V.S.

MAY.

1 Th. Demonstration to Commissioned Officers and Professional Men, at 4 p.m. Fish, by Charles Hattersley, Chief Inspector, Fishmongers' Company.

2 F. Demonstration to Commissioned Officers and Professional Men, at the Billingsgate Fish Market, at 9.30 a.m., by Chas. Hattersley, Chief Inspector, Fishmongers' Company.

Demonstration to Commissioned Officers and Professional Men, at 4 p.m. Jams, Preserved Fruits, by T. Rule, F.G.I.

2 F. } 3 S. } Examinations—London.

3 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m.

5 M. Demonstration to Commissioned Officers and Professional Men, at 4 p.m. Jams, Preserved Fruits, by T. Rule, F.G.I.

6 Tu. Demonstration to Commissioned Officers and Professional Men, at 11 a.m., at Smithfield Meat Market, by T. Dunlop Young, M.R.C.V.S.

Popular Lecture, at 7 p.m. "Exercise, Rest and Sleep," by Leonard Hill, M.B., F.R.S.

7 W. Demonstration to Commissioned Officers and Professional Men, at Billingsgate Fish Market, at 9.30 a.m., by Charles Hattersley, Chief Inspector, Fishmongers' Company.

Demonstration to Commissioned Officers and Professional Men, at 4 p.m. Canned Meat, by T. Rule, F.G.I.

Lecture to Commissioned Officers and Professional Men, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S.

Demonstration to Meat Inspectors' Course, at 7 p.m., at Billingsgate Fish Market, by Charles Hattersley, Chief Inspector, Fishmongers' Company.

9 F. Demonstration to Commissioned Officers and Professional Men, at Smithfield Market, at 11 a.m., by T. Dunlop Young, M.R.C.V.S.

Lecture to Commissioned Officers and Professional Men, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S.

16 F. } 17 S. } Examination for Inspectors of Meat and other Foods—London.

16 F. } 17 S. } **Sessional Meeting,** CHELTENHAM. Discussion on "Aids and Hindrances to the present-day effort to diminish Tuberculosis," by J. H. Garrett, M.D., D.P.H., M.O.H., Cheltenham, and J. Middleton Martin, M.D., D.P.H., County Medical Officer, Gloucester.

20 T. LONDON. At 7.30 p.m., Address on "London's Water Supply," by E. B. Barnard, J.P., M.A., Chairman of the Metropolitan Water Board.

30 F. } 31 S. } Examinations—Belfast.

30 F. } 31 S. } **Sessional Meeting,** CHESTER. Discussion on "Methods of Water Purification and Softening," to be opened by J. Parry, M INST.C.E., Chief Engineer, Liverpool Waterworks.

JUNE.

6 F. } 7 S. } Examinations—Leeds.

13 F. } 14 S. } Examinations—Birmingham.

20 F. } 21 S. } Examinations—Liverpool.

27 F. } 28 S. } Examinations—Cardiff.

JULY.

7-12. **Congress and Exhibition,** EXETER. President: The Right Hon. Earl Fortescue, K.C.B. (Lord Lieutenant of Devonshire).

LIST OF MEMBERS AND ASSOCIATES

ELECTED MARCH, 1913.

MEMBERS.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.
M Marked thus have passed the Examination of the Institute for Inspectors of Meat and Other Foods.
*** Marked thus have passed the Examination of the Institute in Sanitary Science as applied to Buildings and Public Works.**
§ Marked thus have passed the Institute's Examination for Sanitary Surveyors (India).

Reg. No. Date of Election.

3420 1913. Mar. *BALÊCHE, Michel S., *Tantah, Egypt.*

3409 1913. Mar. BEVERIDGE, Lt.-Col. Wilfred William Ogilvy, D.S.O., M.B., D.P.H., R.A.M.C., 53, *Burton Court, S.W.*

3410 1913, Mar. BLIZARD, James Mortimer, ASSOC.M.INST.C.E., *Municipal Offices, Colombo, Ceylon.*

3411 1913. Mar. BRYDONE-JACK, Frederick William, M.D., C.M., (*School M.O.*), 1436, *Eleventh Avenue West, Vancouver, British Columbia.*

3412 1913. Mar. CARDER, Edwin Dixon, B.A., M.B., (*Assist. M.O.H.*), *Assistant Medical Health Officer, Vancouver, British Columbia.*

3423 1907. Oct. CHRISTIE, William S., B.A., B.A.I.DUB., 35, *Queen Victoria Street, E.C.*

3421 1913. Mar. ‡*COLTMAN, Harry, *Lower Hutt, Wellington, New Zealand.*

3413 1913. Mar. GLOVER, Arthur Stanley, B.SC.DURH., *Surrey House, Surrey Street, Norwich.*

3414 1913. Mar. KRIPALANI, Jeramdas K., L.M.&S.BOMB., (*M.O.H.*), *Health Officer, Hyderabad, Sind, India.*

3415 1913. Mar. LUCY, S. H. R., M.R.C.S., L.R.C.P., (*M.O.H.*), *Senior Health Officer, Kuala Lumpur, Federated Malay States.* (3, *Ryder Street, St. James's, S.W.*)

3416 1913. Mar. McKEE, Charles S., M.B., 1200, *Fifteenth Avenue West, Vancouver, British Columbia.* (*City Bacteriologist.*)

3417 1913. Mar. MYLES, Major Charles Duncan, M.B., B.CH., D.P.H., D.T.M., R.A.M.C., "*Riverslea,*" *Dee Banks, Chester.*

3418 1913. Mar. ‡M PITTS, Charles, M.R.C.V.S., 37, *Albion Road, Idle, Bradford.*

3422 1913. Mar, §RAW, N. Srinivasa, A24, *119th Street, Rangoon.*

3419 1913. Mar. VANCE, John Fleming Culun Brown, F.C.S., *Public Analyst, Health Department, City Hall, Vancouver, B.C.*

ASSOCIATES.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.
V Marked thus have passed the Examination for Women Health Visitors and School Nurses.

6099 1913. Mar. V BAKER, Miss Dora Elizabeth, *Milton Mount College, Gravesend.*

6100 1913. Mar. ‡BIRD, Philip William Kimberley, *Bingham Road, Radcliffe-on-Trent, Notts.*

6093 1913. Mar. ‡Bishop, Ernest George, 591, *Hamilton Street, Vancouver, B.C.*

6101 1913. Mar. √Bosworth, Miss Elizabeth Alice, *Braintree Infirmary, Braintree.*

6102 1913. Mar. ‡Counter, William John, 6, *Hartland Road, W. Kilburn, N.W.*

6103 1913. Mar. √Crompton, Miss Bertha, 145, *Tottington Road, Bury.*

6104 1913. Mar. ‡Flynn, Dennis F. S., 79, *Gartmoor Gardens, Wimbledon Park.*

6105 1913. Mar. ‡Gardiner, Frederick Butterworth, *Sanitary Inspector, Napier, New Zealand.*

6106 1913. Mar. ‡Gibbons, John William, 67, *Adelaide Street, Porter Street, Hull.*

6107 1913. Mar. ‡Hamilton, James Inglis, 18, *Northland Drive, Scotstoun, Glasgow.*

6119 1913. Mar. ‡Hammerton, Ernest, *Council Offices, Darfield, near Barnsley.*

6108 1913. Mar. √Heald, Miss Esther Mary, 181, *Cathedral Road, Cardiff.*

6109 1913. Mar. ‡Isaacs, George Owen, 42, *Hastings Street, West Vancouver, British Columbia.*

6110 1913. Mar. ‡Jurd, Matthew Richard, *Regent Street, Waratah, near Newcastle, New South Wales.*

6111 1913. Mar. ‡Kirton, John Henry Bishop, *The Cottage, Withernsea, Yorks.*

6094 1913. Mar. Lister, Henry, *Town Engineer, Barberton, Transvaal, S. Africa.*

6112 1913. Mar. ‡Meek, Richard Horace Ponpard, *Chief Food Inspector, Vancouver, British Columbia.*

6120 1913. Mar. ‡Miller, John, *c/o Empire Service Club*, 130, *Hastings Street West, Vancouver, British Columbia.*

6095 1913. Mar. Morgan, John George, 2770, *Point Grey Road, Vancouver, British Columbia.*

6096 1913. Mar. Mulholland, Aaron Steel, 982, *Richard Street, Vancouver, British Columbia.*

6113 1913. Mar. ‡Owen, David John, 36, *Avondale Road, Gelli, Pentre, Glam.*

6097 1913. Mar. Pleister, Miss Else M. J., 9, *Lymington Mansions, West Hampstead, N.W.*

6114 1913. Mar. ‡Reilly, Francis John, 4, *The Laurels, Rubby Banks, Cockermouth.*

6098 1913. Mar. Sadler, Albert, 33, *Hugo Road, Tufnell Park, N.*

6115 1913. Mar. ‡Scott, James Francis, 150, *Welbeck Street, Prince's Avenue, Hull.*

6116 1913. Mar. ‡Stacey, Henry, 28, *Broad Street, Chesham, Bucks.*

6117 1913. Mar. √Story, Miss Sylvia, *c/o D. Story, Esq.*, "*The Chálet,*" *Ashley Road, Solihull, Warwickshire.*

6118 1913. Mar. ‡Swift, Edmund, 2, *Olive Lane, Darwen.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY.

MARCH, 1913.

*** *For publications of Societies and Institutions, etc., see under "Academies."*

ACADEMIES (BRITISH).

London. *Auctioneers and Estate Agents' Institute.* Annual Record, Vol. II., Part III. 24 pp., 8vo. London, 1912. *The Institute.*

——— *Institution of Mechanical Engineers.* Proceedings, July 1912, Belfast Meeting. 281 pp., 8vo. London, 1913. *The Institution.*

——— *Society of Engineers.* Transactions for 1912. 350 pp., 8vo. London, 1912. *The Society.*

——— *Board of Agriculture and Fisheries.* Agricultural Statistics, 1911, Vol. XLVI., Part V. Colonial and Foreign Statistics. 142 pp., 8vo. London, 1913. *The Board.*

——— *Geological Survey of England and Wales.* Record of London Wells, by G. Barrow, F.G.S., and L. J. Wills, M.A., F.G.S. 215 pp., 8vo. London, 1913. *J. J. H. Teall, Director.*

ACADEMIES (COLONIAL AND FOREIGN).

Toronto. *Canadian Association for the Prevention of Tuberculosis.* Twelfth Annual Report. 316 pp., 8vo. Toronto, 1912. *The Association.*

Philadelphia. *College of Physicians.* Annual Report of the Library Committee for 1912. 16 pp., 8vo. Philadelphia, 1913. *The College.*

Sydney. *Royal Society of New South Wales.* Journal and Proceedings for 1911, Vol. XLV., Part IV. 101 pp., 8vo. Sydney, 1912. *The Society.*

Hooker, *A. H.* Chloride of Lime in Sanitation. 231 pp., 8vo. New York, 1913. *The Hooker Electro-Chemical Co. (Publishers).*

Local Government Board. Report upon the Biological Properties of Milk, both of Human Species and of Cows, considered in Special Relation to the Feeding of Infants, by Janet E. Lane-Claypon, M.D. 95 pp., 8vo. London, 1913.

——— Dr. Hugh A. Macewen's Report on the Outbreak of Enteric Fever in Ringwood, 1912, No. 74. 16 pp., 8vo. London, 1912. *A. Newsholme, M.D., F.R.C.P.*

Metchnikoff, *E.* The Warfare Against Tuberculosis. 25 pp., 8vo. London, 1913. *The National Health Society.*

Paris. *Ministère de l'Instruction Publique.* Recherches sur l'Epuration Biologique et Chimique des Eaux d'Égout. 290 pp., 8vo. Paris, 1913. *Dr. A. Calmette.*

Prudential Insurance Co. of America. Exhibits at the International Congress on Hygiene and Demography. 79 pp., 8vo. Washington, 1912. *F. L. Hoffman, Statistician.*

Scotland Registrar-General. Report of the Twelfth Decennial Census. Vol. I., Part 36, County of Sutherland. 34 pp. Part 35, County of Stirling. Vol. I., Part 34, County of Shetland. Part 33, County of Selkirk. Fcp. London, 1912. *J. Patten Macdougall, Registrar-General.*

Siam. The Climate of Bangkok, by H. C. Highet, M.D., D.P.H., Principal Medical Officer, Local Sanitary Department, Bangkok. 38 pp., 8vo. Bangkok, 1912. *The Author.*

United States Army, Surgeon-General's Office. Index Catalogue to Library. Vol. XVII. Suaheli-Testut. 788 pp., fcp. Washington, 1912. *Lieut.-Col. Walter D. McCaw.*

United States Public Health Service. Collected Studies on Typhus. 143 pp., 8vo. Washington, 1912. *Rupert Blue, Surgeon-General.*

Windermere. Official Guide. 48 pp., 8vo. Windermere. *A. J. Freeman.*

THE TWENTY-EIGHTH CONGRESS OF THE INSTITUTE WILL BE HELD IN EXETER FROM JULY 7TH TO 12TH, 1913.

PRESIDENT.

THE RIGHT HON. EARL FORTESCUE, K.C.B.
(LORD LIEUTENANT OF DEVONSHIRE).

CHAIRMAN OF LOCAL COMMITTEE.

THE RIGHT WORSHIPFUL THE MAYOR OF EXETER.

Lecture to the Congress.

By SIR WILLIAM J. COLLINS, D.L., J.P., M.D., M.S., F.R.C.S.

Sections and Conferences.

A—Sanitary Science and Preventive Medicine.

President: A. WYNTER BLYTH, M.R.C.S., F.I.C., F.C.S.
Recording Secretary: CHARLES PORTER, M.D., B.Sc., M.O.H., St. Marylebone.

B—Engineering and Architecture.

President: H. PERCY BOULNOIS, M.Inst.C.E., Late Deputy Chief Engineering Inspector, Local Government Board.
Recording Secretary: A. SAXON SNELL, F.R.I.B.A., 9, Bentinck Street, Manchester Square, W.

C—Domestic Hygiene.

President: THE MAYORESS OF EXETER (Mrs. MICHELMORE).

D—Hygiene of Infancy and Child Study.

President: E. J. DOMVILLE, M.R.C.S., J.P.
Recording Secretary: F. E. FREMANTLE, M.A., M.B., F.R.C.P., County Medical Officer of Health, Hertford.

I.—Municipal Representatives.

President:—THE RIGHT WORSHIPFUL THE MAYOR OF EXETER.
Recording Secretary: H. LLOYD PARRY, Town Clerk, Exeter.

II.—Medical Officers of Health.

President: GEORGE REID, M.D., D.P.H., County Medical Officer of Health, Staffordshire.
Recording Secretary: A. WELLESLEY HARRIS, M.R.C.S., D.P.H., M.O.H., Lewisham.

III.—Engineers and Surveyors.

President: THOMAS MOULDING, M.Inst.C.E., City Engineer, Exeter.
Recording Secretary: JOHN S. BRODIE, M.Inst.C.E., Borough Engineer, Blackpool.

IV.—Veterinary Inspectors.

President: PROF. J. PENBERTHY, F.R.C.V.S.
Recording Secretary: J. A. DIXON, M.R.C.V.S., Veterinary Inspector, Leeds.

V.—Sanitary Inspectors.

President: JAMES ROBINSON, County Health Inspector, Durham C.C.
Recording Secretary: W. J. ADDISCOTT, Chief Inspector of Nuisances, Plymouth.

The Health Exhibition will be held in the Victoria Hall from July 5th to 12th.

EXETER.

The Place of meeting for the Congress and Exhibition of the Institute, 1913.

By H. Tapley-Soper, F.R.Hist.S., *City Librarian.*

Nearly thirty-three years have passed away since The Royal Sanitary Institute held its Annual Congress in the "Ever Faithful" City of Exeter. During this lapse of time many alterations and improvements have been carried out in this historic place; some, no doubt, as a result of the enlightenment gained during that meeting. It is hoped that such advances as have been made will merit the commendation of those members of the Institute who are about to pay the Capital of the West a second visit, and that the visit of those who are about to honour the City for the first time will be equally stimulating. In carrying out improvements, the local authorities have been mindful of the special charm which all old cities possess, and in introducing reform have been careful to interfere as little as possible with ancient landmarks and associations, considerations which often transform an apparently easy task into one of some complexity.

Wood Paving, Electric Lighting, Tramways, and Street Improvements have been inaugurated. A handsome one-span steel bridge has succeeded the stone bridge of three arches which for over a hundred years crossed the river Exe at the foot of the steep Fore Street. The ancient Guildhall has been restored, and some handsome business premises erected.

Educational facilities have been improved by the erection of a University College, and the enlargement or rebuilding of secondary schools. In 1900 the City's boundaries were extended by the inclusion of the parish of St. Thomas the Apostle, and action is now being taken for the inclusion of the parish of Heavitree within the city's jurisdiction. Perhaps the experiment most interesting to the members of The Royal Sanitary Institute which has been carried out since their visit in 1880 is in connection with sewage disposal. The septic tank system is now a common feature of many towns, but its use for the disposal of the sewage of a large town was first put into practice by Mr. Donald Cameron at Exeter in 1899. Mr. Cameron was the City's Engineer and Surveyor, his predecessor in office being Mr. Boulnois, who will act as President of the Engineering and Architecture Section of this year's Congress.

Exeter claims prescriptive origin as a City. It has been the site of a continuous settlement since its occupation by the British under the name of Penholtkeyre. It has been held at fee farm *ante et post conquestum.* The City is described by Professor Freeman as "the most ancient of the Cities of Britain, 'before the incarnation of Christ a City walled and suburb to the same, of the most reputation, worship, defence and defensible of all these parties' . . . a typical English city, alike in its greatness and in its practical fall from greatness, but more than an English city in its direct connection with two states of things more ancient than the English name in Britain, the City alike of Briton, Roman, and Englishman. . . . Others can boast of a fuller share of modern greatness: none

other can trace up a life so unbroken to so remote a past." The details of this remote past are hidden behind an impenetrable veil. Matthew of Paris says Exeter was besieged for eight days in A.D. 52 by Vespasian the Roman General and relieved by Aviragus the King. This statement, however, is regarded as legendary.

Exeter is mentioned in an itinerary published during the reign of Antoninus who became emperor of Rome A.D. 138, and who is known in English history as the builder of the great wall between the Forth and the Clyde. The City is also referred to in Ptolemy's "System of Geography," written about A.D. 120. Matthew of Westminster, in his "*Flores Historiarum*," says Exeter was besieged by Penda, King of Mercia, about 633. A number of Roman Coins, now to be seen in the Museum, have been dug up in various parts of the City and its vicinity, and these, in addition to some examples of pottery, and a yard or two of undoubted Roman tesseræ, now in the Police Station at the back of the Guildhall, are the only relics of the Roman occupation of the City which have come down to us. From the chronicles of the period we know that Exeter was the most Western outpost of the Roman army, but her occupation seems to have taken the form of a peaceful settlement side by side with the British inhabitants rather than a conquest, consequently the impression left on Exeter by the Romans, which in the long and unbroken record of the City's history was but a passing event, was rather that of the etcher than that of the carver.

When we come down to the period of the Norman Conquest, we are on surer ground; in fact, it is at this date that Exeter's written history commences. Everyone has heard of the "Domesday Book," but few general readers know that Exeter has her own special Domesday Book preserved in the Library of her Cathedral. In the spring of 1068 the City was besieged by William the Conqueror and surrendered on favourable terms. Forty-eight houses, estimated to be about a sixth part of the whole City, were destroyed. The great importance of the City at that time is indicated by the fact that Gytha, the mother of King Harold, the last of the restored Saxon dynasty, with many nobles and members of the Court, had taken refuge within the City's Walls, and only escaped by the Water Gate a short time before the Conqueror entered. To detail the many sieges which the City subsequently withstood is beyond the purpose of this article, but we may mention that she has been invested more times than any other English town; the last occasion being during the Commonwealth.

King Charles arrived in the City on the 26th July, 1644, in pursuit of the rebels under the command of the Earl of Essex, His Queen Henrietta Maria came in May of the same year. She was then far advanced in pregnancy, and it was thought that she would be safe in the well-fortified and loyal City of Exeter. She kept her court at Bedford House, the present site of Bedford Circus, and here, on the morning of the 16th June, she was delivered of a daughter, who was baptised at the Cathedral. The entry in the Cathedral Register reads

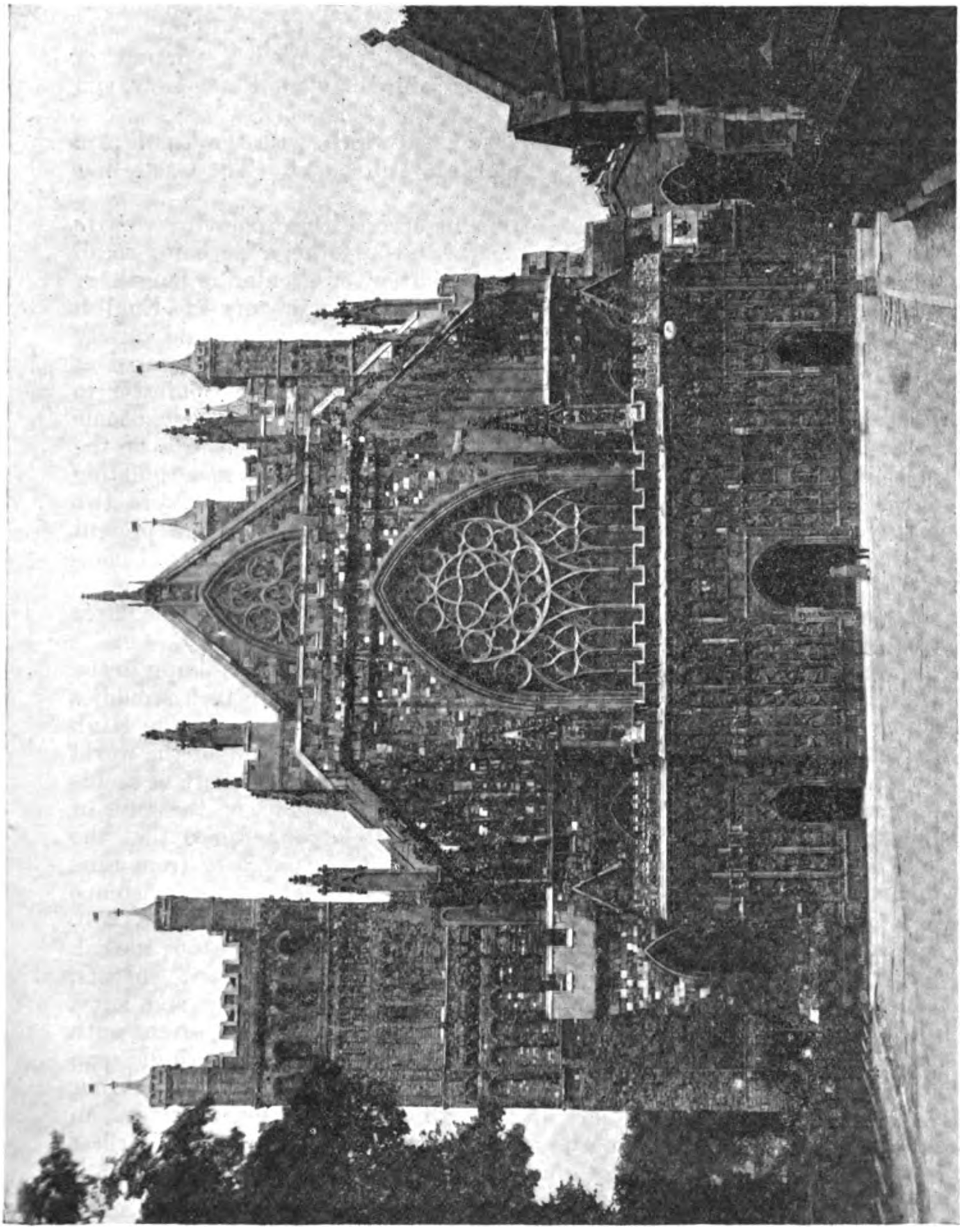


Photo by Heath & Bradnee, Exeter.

EXETER CATHEDRAL: The Norman Towers and West Front.

"Henrietta, daughter of our Soveraigne Lord King Charles and our Gracious Queen Mary, was baptised the 21st July, 1644."

To commemorate this event Charles II. presented a portrait of Princess Henrietta to the City. It was painted by Sir Peter Lely, and now hangs in the Guildhall.

About two-thirds of the walls of the City, which, with the Castle, are said to have been first raised by Athelstan, still stand. The Castle was rebuilt by the Conqueror in 1068.

Exeter Cathedral is considered from an architectural point of view to be the most interesting of all our cathedrals. Others, perhaps, recall more important historical associations, are loftier, or greater in length, or can show more work of the earlier periods in the history of English architecture, but none can display to the student such a wealth and variety of styles and decoration. The See of Exeter was originally located at Crediton, but in the year 1050 was removed by Edward the Confessor to Exeter, and Leofric installed as Bishop. At this time there existed some monastic buildings which are supposed to have stood on the site of the present Lady Chapel. Bishop Warelwast commenced a new building about 1111, but all we know of it is that its principal features were two massive towers, which still stand and form the transepts of the present edifice, which was commenced by Bishop Quivel (1280-1291) and completed by Bishop Grandisson (1327-1369). The great screen, which is such a conspicuous feature of the West Front, was an addition of the latter part of the fourteenth century.

Next to the Cathedral, the most interesting and historic building in the City is the Guildhall, with its bold Elizabethan portico, which straddles across the pavement, and forms such a distinctive feature of the High Street, which, apart from this building, is celebrated throughout the world for the fine Tudor houses which it contains, and for the variety of architectural specimens which it displays. The oldest portions of the walls of the present Guildhall date back to 1330, and it is conjectured that the site has been occupied by buildings used for public purposes from time immemorial. The earliest known documentary evidence of the existence of a Guildhall on this spot is a deed, executed between 1234 and 1253. The major portion of the hall in its present state dates from 1466; the oak wainscot, bearing the arms of nearly one hundred mayors, sheriffs, benefactors, etc., being added in 1556. The hall is spacious and lofty, and the atmosphere is that of the Middle Ages. The heavy seventeenth century candelabrum suspended from a cross rib, the graceful single span timbered roof supported on grotesque corbels, the Royal and City Arms, and the heavy minstrels' gallery all belong to an almost forgotten era, an age redolent of stirring memories and curious superstitions. The earliest existing Exeter Charter was granted by Henry II. (1154-1189), and is attested by Thomas á Becket. It is supposed that the office of mayor was created in the reign of King John, and the year 1200 is regarded as the year of its institution. At any rate, documentary evidence exists of the fact that there was a Mayor of Exeter as early as 1206, and from 1216

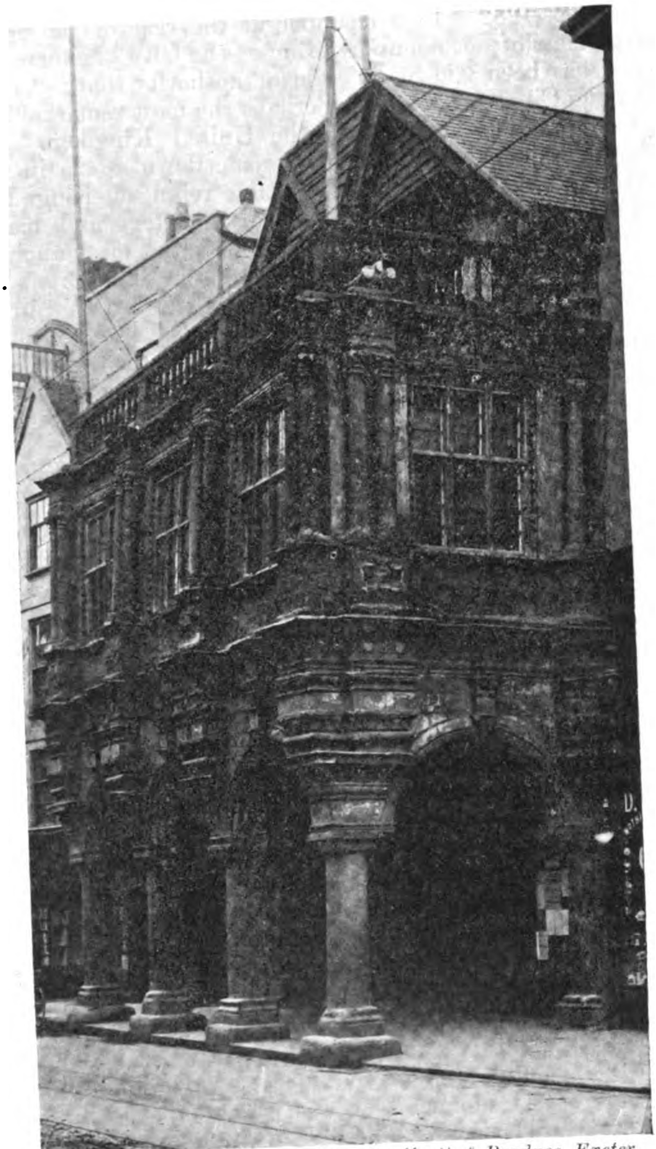


Photo by Heath & Bradnee, Exeter.

THE GUILDHALL, EXETER.

the list of holders of this office is almost complete. The first Recorder was appointed in 1354, and the first Sheriff in 1537, the year in which the City was constituted a county in itself. The office of Town Clerk is mentioned as early as 1282. In a chamber at the rear of the Guildhall is stored a large mass of documents relating to the City's history. Of these documents it has been said by an eminent authority that: "The records possessed by the City of Exeter are perhaps the most remarkable that can be boasted by any city or town in the United Kingdom. They are exceedingly voluminous . . . and have come down to us in an almost unbroken series . . . extending from the reign of King Edward I. (1272-1307)." They include fifty Royal Charters and many Royal autograph letters. The City's corporate seal is the most ancient in the kingdom; it dates from 1170, and is still in use. The City's regalia includes two swords, one presented to the City by Edward IV., in 1470, "to be carried before the Mayor on all public occasions," and another given by Henry VII., in 1497, when he also presented the Cap of Maintenance. There are also four maces, a loving cup, and a silver salver. The Mayor's chain was presented in 1874 by members of the Royal Archæological Institute, "in recognition of their hospitable reception during the Congress held in the City in 1873." The Sheriff's chain was presented in 1878.

In South Street is the Hall of the Vicars Choral built in the fifteenth century for the College of Vicars Choral which was founded in 1388. It pertains, as its name indicates, to the "Gentlemen of the Choir" or Vicars Choral of the Cathedral. The Tucker's Hall, another ancient building, is in Fore Street.

In 1222 the City contained nineteen parishes, each having a small Church; of these Churches several still remain. St. Pancras, behind the Guildhall, is considered to be the oldest. The nave of St. Mary Arches exhibits some fine Norman work, and in its vicinity are the remains of the Priory of St. Nicholas, the Norman undercroft of which is particularly interesting. These remains have recently been acquired by the City Corporation, and will be restored and be kept open for the inspection of visitors.

The Canal, now used largely for pleasure purposes, runs parallel with the river as far as Turf, a distance of $5\frac{1}{8}$ miles. It was constructed in 1563, and is the earliest locked waterway in England. It is situated in the midst of charming scenery, and affords excellent fishing and boating facilities. There is an hotel at Double Locks, about half-way along its banks, and another at Turf, the point where the canal joins the river Exe.

The area of Exeter is 3,168 acres. The population of the City at the last census was 48,660, and the suburb of Heavitree 10,950. The City occupies the flat summit and declivities of a ridge-like hill, which rises from 25·9 feet above Ordnance Datum at the Quay, to 136·5 feet at the Guildhall, 225·9 at Elmside, and 433·5 at the top of Pennsylvania, the average height being about 150 feet above Ordnance Datum. The site of the City is surrounded by higher hills on every side excepting the south-east, where the estuary of the Exe opens to the English Channel, about

Photo by Miss May Hare, Exeter.

THE ROYAL ALBERT MEMORIAL—University College and Public Library.

12 miles distant. The greater part of the ancient City and its immediate surroundings is built upon the New Red Sandstone: that to the north is on the carboniferous shale, a portion of St. Leonard's stands on gravel, and the eastern side on the clay. The annexed parts of St. Thomas's parish are chiefly built on the old bed of the Exe, and the sub-soil is gravel. The neighburhoood abounds with beautiful scenery of great variety, presenting within only a short distance the different aspects of moor, mountain, and woodland scenery. The climate is soft, warm, mild, calm and equable, and comparatively free from storms. During the winter season the temperature is rarely maintained for any length of time at a degree so low as to render the climate particularly inclement; frost only occasionally occurring, and then not for any long continuance. The birth-rate for 1911 was 19·81 per 1,000, and the death-rate 15·11 per 1,000. The death-rate for notifiable diseases was ·16 per 1,000, and for non-notifiable diseases 1·70 per 1,000.

The staff of the Public Health Department consists of two part-time medical officers of health, a chief inspector of nuisances, two assistant inspectors, a general assistant, two clerks, and two health visitors.

At the public abattoir there is a resident Superintendent, who is under the control of the chief inspector.

The Council has recently accepted a tender for the enlargement of the Isolation Hospital at a cost of over £15,000. A Matron is at the head of the staff of the Isolation Hospital, which includes a charge nurse, three staff nurses, five probationers, and one laundress, a porter and gardener, and household staff. Patients are received from many of the adjoining districts, as well as from the City. Systematic medical inspection of school children was put into operation early in 1908. The school medical service is entirely separate from that of the medical officer of health, but the relations between the two departments are of necessity intimately connected in dealing with infectious disease.

In addition to the ordinary elementary schools, Exeter possesses a school for physically defective children, at present in temporary premises, and a class for educating dull and backward children (not mentally defective).

For attending to the physical needs of the children, Exeter being so well provided with medical charities, ordinary treatment can be obtained for the poorer children from the hospital and eye infirmary.

The Education Authority have established for the treatment of school children:—

A cleansing station (for dealing with dirty and verminous children).

An inspection clinic for the detailed examination of the more intricate cases found in school examinations.

A dental clinic (with whole-time dental officer).

An X-ray apparatus for the treatment of ringworm by the school medical officer.

The City Council of Exeter was the pioneer of the Septic Tank System for the treatment of the sewage of a town, and the whole of the sewage of the City is now dealt with by bacteriological treatment on this system at two sewage disposal works which together comprise ten septic tanks with an approximate area of one and one-sixth of an acre. There are twenty-eight contact beds covering three acres, and fourteen and a half acres of irrigation land, in addition to storm-water filters and sludge lagoons. The Council maintains an Isolation Hospital, a Pauper Lunatic Asylum, Markets, Public Baths, a Public Abattoir, eight Parks or Pleasure Grounds, and several open spaces and street enclosures, three Allotment Grounds, Electric Tramways, Water-works, and an Electric Power Station. The City's Gas supply is controlled by a Company. Electric current and water are supplied to neighbouring districts, and the tramway system extends beyond the City boundaries. There are 4 miles 1,694 yards of tramway track. The City Council is also the Port Authority for the Estuary of the Exe, and maintain a steam tug and dredger. The Port Sanitary Authority, of which Exeter is a constituent, have

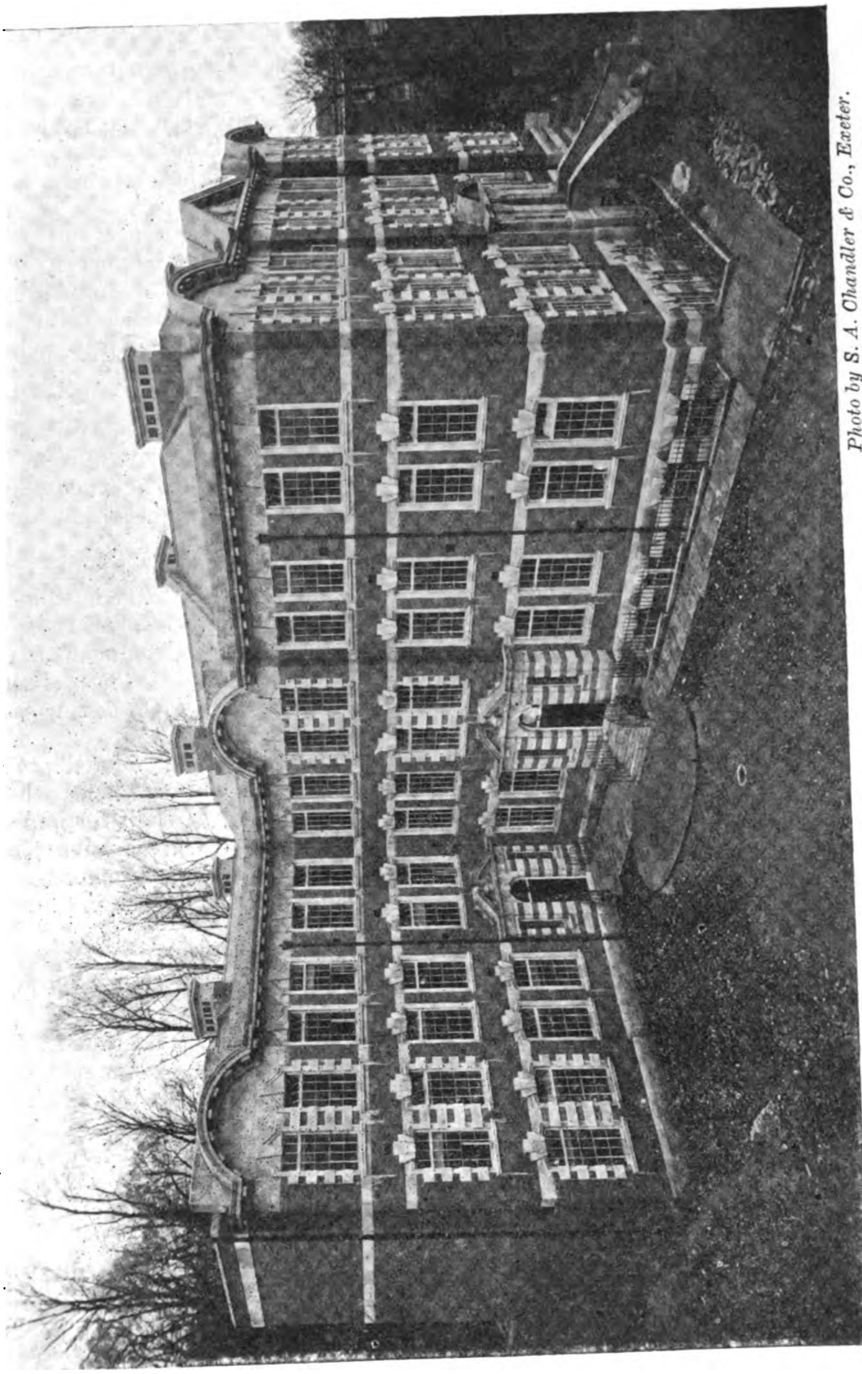


Photo by S. A. Chandler & Co., Exeter.

THE UNIVERSITY COLLEGE BUILDINGS, the Headquarters of the Exeter Congress.

provided a floating hospital in the Estuary. Two cemeteries are under the Council's control.

The disposal of House Refuse has recently been the subject of an experiment under which the refuse is conveyed by traction engines to local farmers for use on the land. The Council has recently, however, decided to take steps for the erection of a destructor.

The City's Educational facilities are quite exceptional, and much too elaborate to be dealt with in this article. It should be mentioned, however, that the educational ladder is so designed that a complete system of scholarships has been provided to enable boys and girls of ability to pass from the elementary schools to one of the endowed Secondary Schools of the City, and thence to one of the older Universities, or to the Exeter University College.

Since 1869 the Council has controlled a Museum, Public Library, and Art School, located in a handsome building, situated in Queen Street, which was originally built by public subscription. The maximum rate under the Public Libraries and Museums Acts is revised for their maintenance.

Around this institution has grown up a flourishing University College, with a day training department and manual schools attached. There are upwards of 1,000 students of various grades on the books, and the growth of the work has recently necessitated the erection of a commodious pile of buildings, consisting of classrooms and laboratories. These buildings will be the headquarters of The Royal Sanitary Institute during its visit to Exeter.

Ancient cities necessarily contain much old and dilapidated property, and in this respect Exeter is no exception to the rule. The Authorities have embraced every opportunity which has presented itself for improving congested and insanitary districts, and two extensive areas have recently been scheduled for demolition. The Town Planning Committee have under consideration a scheme of town planning, and for the improvement and beautifying the central portion of the City.

The art of weaving is said to have been established in Exeter on a considerable scale as early as the reign of Edward I. (1272–1307). In the reign of Edward IV. (1461–1483) the industry was considerably improved by the immigration of foreign weavers, and by the time Elizabeth came to the throne Exeter's woollen stuffs and serges were held in the highest repute. The industry was also extensively practised in other parts of the Country, but Exeter was the principal mart, and her merchants did an extensive trade with the continent, large cargoes of wine and other commodities being returned in exchange. The lower, or West Quarter, near the Quay, now the poorer part of the City, was the locality associated more particularly with the serge and cloth trade, and here can still be seen many of the houses in which the great merchants lived. Rack Street and Rack Fields derive their names from the racks on which the woven material was racked or stretched to dry. With the invention of the steam-engine and the application of mechanical power to weaving

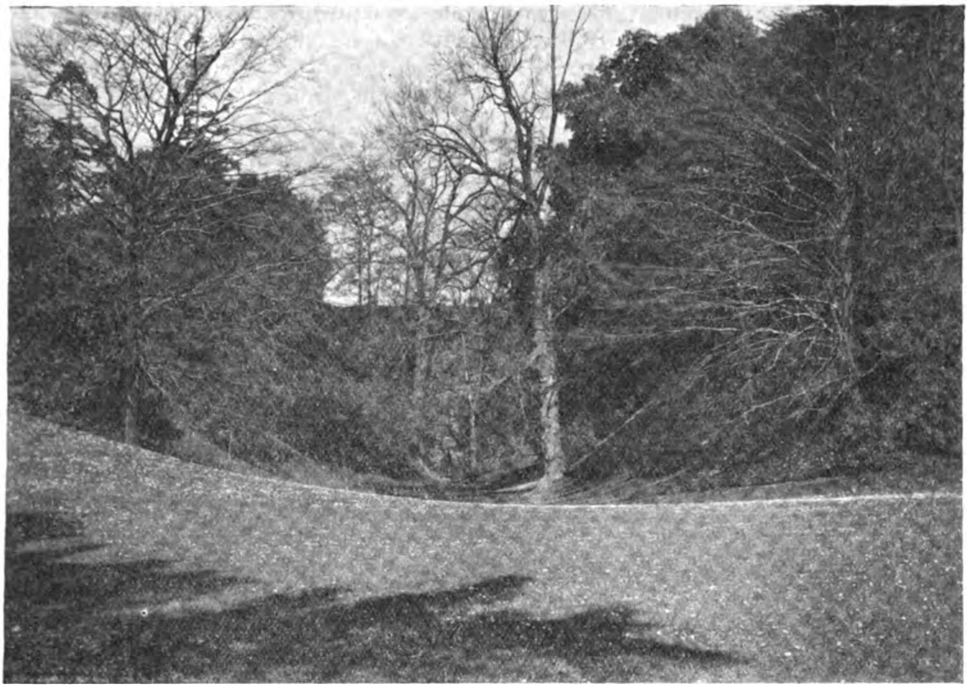


Photo by Heath & Bradnee, Exeter.

"A View in Rougemont Park."

the industry departed from Devon to districts where coal is more easily obtained, and the trade of Exeter declined. The introduction of the steam locomotive also extinguished the fame which Exeter enjoyed as a coaching centre, and considerably diminished the trade of the Canal. The seven railway routes which converge on Exeter have, however, to some extent compensated for the loss of the importance of the Canal, and the fame of the City as a coaching centre, but during the last century the City's trade very much declined. The past fifteen years have, however, witnessed a remarkable revival. The local authorities have followed a vigorous and progressive policy and much individual enterprise has sprung up, consequently the City is still in a very flourishing condition.

The largest industry of present-day Exeter is the engineering works of Messrs. Willey & Co., at St. Thomas's, where about 700 men are employed in works covering an area of over fifteen acres, one of the principal items of manufacture being penny-in-the-slot meters. Collar and lace factories have also recently been established in this district.

There are also in the City several large printing establishments, Messrs. Lloyd's tobacco factory, Messrs. Thomas's soap works, several breweries, the nurseries of Messrs. Veitch (which can be viewed on application), well-known studios for sculpture and stained glass, ecclesiastical furniture works, art pottery kilns, tanneries, paper mills, iron and brass foundries, and several smaller industries.

These industries of course employ a large number of workpeople, but Exeter cannot now be described as an industrial town; a large percentage of her population is engaged in shopkeeping, for as the principal town between Bristol and Plymouth and the centre of an extensive residential district her distributing trade is very considerable. In regaining her present affluent position the advent of the motor car has undoubtedly been a contributory factor, and Exeter is now regarded as the principal tourist centre of the West. An Information Bureau has been opened, and a large and ever-increasing number of English and American tourists visit the City. Her admirable situation near the sea and moorland and in England's most beautiful County makes Exeter an ideal centre for those who are fond of touring, whilst the City's antiquities and historical associations appeal to many.

The population of the district is increasing, and the neighbourhood is much in favour as a residential quarter amongst retired naval and military men, and those who have spent much of their time abroad. It is a garrison town, two important barracks being situate here.

The City is well provided with places of amusement, such as social and political clubs, musical, literary, operatic, and scientific societies. There is also a theatre, a hippodrome, picture palaces, and several large public halls. A successful professional football team is maintained, and the district offers exceptional facilities for hunting, fishing, golf, yachting and other forms of outdoor sport.

THE ROYAL SANITARY INSTITUTE.

MEETINGS HELD.

Sessional Meetings.

On Tuesday, April 8th, at 4 p.m., the members visited the Westminster Electric Supply Company's Showrooms, when a Demonstration of Electrical Cooking and Domestic Appliances was given, and the members were entertained to Tea by the Company.

Wimbledon.—The meeting was held in the Pelham Road Schools on Saturday, April 12th, at 10.30 a.m., when the following discussions took place: "Environment in relation to Disease," opened by Elwin H. T. Nash, M.R.C.S., D.P.H., M.O.H.; "Infant Consultation, its Aims and Limitations," opened by Beatrice McGregor, M.B., C.M.; "Open Spaces Policy and its Local Aspect," opened by Mr. Richardson Evans; and "Desirability of Open Spaces along the Wandle," opened by Miss Parton.

Visits were made in the afternoon to the Technical Schools; to the John Innes Park and Horticultural Institution, under the guidance of the Director, W. Bateson, M.A., D.Sc., F.R.S., and to Wandle Park, where the Mayoress, Mrs. McSheehy, entertained the members to Tea.

Stafford.—The meeting was held in the County Council Buildings on April 25th, at 7.30 p.m., when a discussion on "The Milk and Dairies Bill" was opened by George Reid, M.D., D.P.H., County Medical Officer of Health for Staffordshire. The chair was taken by Louis C. Parkes, M.D., M.R.C.S., D.P.H.

On Saturday, April 26th, a visit was made to Messrs. Siemens' Electrical Works, and was followed by a Smoke Demonstration of the efficiency of the ventilation in one of the "Staffordshire" type of schools. The members were entertained to Luncheon by the Mayor and Corporation.

Ordinary General Meeting.

The Ordinary General Meeting was held at the Institute on Wednesday, April 23rd, Mr. H. Percy Boulnois, Chairman of Council, in the chair. The period for which His Grace the Duke of Northumberland was eligible as President of the Institute having expired, a Vote of Thanks was unanimously passed to him for the cordial sympathy and assistance given to the Institute during his nine years of office. The Right Hon. The Earl of Plymouth, P.C., D.L., J.P., was elected President of the Institute, Sir B. Arthur Whitelegge, K.C.B., M.D., B.Sc., was elected a Vice-President, and the following were elected as new Members of Council: William J. Howarth, M.D., Ch.B., D.P.H., E. J. Lovegrove, M.Inst.C.E., O. Claude Robson, M.Inst.C.E., Henry Rofe, M.Inst.C.E., F.G.S.

Lecture to the Institute.

A lecture was given at the Institute on Wednesday, April 23rd, on "Insect-carried Diseases, and their Prevention," by C. W. Daniels, M.B., M.R.C.S. Sir William J. Collins, D.L., J.P., M.D., F.R.C.S. (Vice-President), in the chair.

The lecture was followed by a Display of Micro-Cinematograph Films.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses have been held at:—

Hobart, Tasmania, December 21st and 23rd, 1912.
Perth, Western Australia, January 16th and 18th, 1913.
Bristol, April 4th and 5th.
Edinburgh, April 11th and 12th.
Manchester, April 18th and 19th.

For Smoke Inspectors:—

Manchester, April 18th and 19th.

At these Examinations 127 candidates presented themselves, and the following were awarded certificates:—

Sanitary Science as applied to Buildings and Public Works.

Ahmed, Syed Mohi-uddin.
Currie, Arthur Lorimer.
Higgs, Franklyn.

Women Health Visitors and School Nurses.

Baikie, Nellie Shearer.
Bremner, Isabelle.
Budgett, Elizabeth Marian.
Davidson, Elizabeth.
Dimond, Elsie Florence.
Evans, Georgina.
Grant, May.
Gubbin, May Brendon.
Jenkins, Elizabeth Gertrude.
Jones, Letitia Jane.
McLaren, Euphemia Lily.
Nichol, Margaret Mitchell.
Norrie, Emma Maud.
Palmer, Rosalie Emie.
Pithie, Margaret Aitken.
Rawlings, Frances Kathleen.
Richards, Winifred Mary.
Telfer, Agnes Leckie.
Torrop, Katherine Spens.
Whyte, Anne Campbell.

School Hygiene, including Elementary Physiology.

Dunn, Gladys May.
Ellis, Miriam Maude.
Gray, William Smith.
Pierson, Lalla.

Inspectors of Nuisances.

Ball, Cecil Edward.
Barton, Alexander.
Brown, Robert Bell.
Burr, William Henry Urch.
Butler, Helen.
Cameron, George William.
Campbell, John Thomas.
Casstles, Thomas.
Cheetham, Henry.
Cogger, William.
Davies, Frederick William.
Dixon, Reginald.
Ellison, James.
Evans, John Haydn.
Fesenmeyer, Lancelot.
Foristal, Isaac.
Forman, Frederick Gerald.
Fraser, Dorothy.
Graham, William George.
Hall, Ursula Alice.
Hacking, Sam.
Henderson, Andrew Westwater.
Howarth, Fred.
Job, Edwin Mansel.
Killip, Joseph.
Lear, Cecil.

Leece, Florence Louisa.
Lewis, Thomas Oddian.
Macqueen, Elizabeth Charlotte.
McCormick, Hugh.
Mills, Charles Simpson.
Mules, John F.
Prideaux, Byron Thomas.
Rigby, Madeline May.
Robinson, Walter Richard.
Simmons, Albert William.
Stockdale, Walter Ernest.
Tootell, Edith.
Tucker, Arthur Edward.
Turner, Fred.
Weeks, Herbert John.
Whalley, Catherine.
Wheeler, Ernest.
Williams, Doris Mary.
Wise, Francis Seymour.

Smoke Inspectors.

Barbary, John Ewart Trounce.
Hamilton, Harry.

FORTHCOMING MEETINGS.

Sessional Meetings.

Cheltenham, Friday, May 16th, at 7.30 p.m., in the Town Hall. Discussion on "Aids and Hindrances to the present-day effort to Diminish Tuberculosis," to be opened by J. H. Garrett, M.D., D.P.H., M.O.H., Cheltenham, and J. Middleton Martin, M.D., D.P.H., County Medical Officer of Health, Gloucester.

On Saturday, May 17th, the members will be entertained by W. N Skillicorne, J.P. (Chairman of the Public Health Committee and ex-Mayor), and visits will be made to Slaughter-houses and Public Abattoirs, Destructor, Electric Light Works and Disinfector, Clinic for treatment of school children, and the Pittville Gardens and Cleeve Hill.

London, Tuesday, May 20th, at 7.30 p.m. Address on "London's Water Supply" (illustrated by lantern slides), by E. B. Barnard, J.P., M.A., Chairman of the Metropolitan Water Board.

On Wednesday, May 21st, visit to the King George Reservoir, Chingford. Members will leave Liverpool Street Station for Enfield Lock at 2.51 p.m.

Chester, Friday, May 30th, at 7 p.m., in the Town Hall. Discussion on "Methods of Water Purification and Softening," to be opened by J. Parry, M.Inst.C.E., Chief Engineer, Liverpool Waterworks.

On Saturday, May 31st, visits will be made to the Waterworks, etc.

Popular Lectures.

Tuesday, May 6th, at 7 p.m.: "Exercise, Rest, and Sleep," by Leonard Hill, M.B., F.R.S.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors Qualifying for Membership, for Inspectors of Nuisances, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses:—

London, May 2nd and 3rd.
Belfast, „ 30th and 31st.
Leeds, June 6th and 7th.
Birmingham, June 13th and 14th.
Kimberley, June 27th and 28th.

For Smoke Inspectors:—

London, May 2nd and 3rd.

For Inspectors of Meat and Other Foods:—

London, May 16th and 17th.

Calendar for May and June, 1913.

MAY.

1 Th. Demonstration to Commissioned Officers and Professional Men, at 11 a.m., at Smithfield Meat Market, by T. Dunlop Young, M.R.C.V.S.

Demonstration to Commissioned Officers and Professional Men, at 4 p.m. Fish, by Charles Hattersley, Chief Inspector, Fishmongers' Company.

2 F. Demonstration to Commissioned Officers and Professional Men, at the Billingsgate Fish Market, at 9.30 a.m., by Chas. Hattersley.

Demonstration to Commissioned Officers and Professional Men, at 4 p.m. Jams Preserved Fruits, by T. Rule, F.G.I.

2 F. } 3 S. } Examinations—London.

3 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m.

5 M. Demonstration to Commissioned Officers and Professional Men, at 4 p.m. Jams, Preserved Fruits, by T. Rule, F.G.I.

6 Tu. Demonstration to Commissioned Officers and Professional Men, at 11 a.m., at Smithfield Meat Market, by T. Dunlop Young, M.R.C.V.S.

Popular Lecture, at 7 p.m. "Exercise, Rest and Sleep," by Leonard Hill, M.B., F.R.S.

7 W. Demonstration to Commissioned Officers and Professional Men, at Billingsgate Fish Market, at 9.30 a.m., by Charles Hattersley.

Demonstration to Commissioned Officers and Professional Men, at 4 p.m. Canned Meat, by T. Rule, F.G.I.

Lecture to Commissioned Officers and Professional Men, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S.

Demonstration to Meat Inspectors' Course, at 7 p.m., at Billingsgate Fish Market, by Charles Hattersley.

8 Th. Demonstration to Commissioned Officers and Professional Men, at 11 a.m., at Smithfield Meat Market, by T. Dunlop Young, M.R.C.V.S.

9 F. Demonstration to Commissioned Officers and Professional Men, at Smithfield Market, at 11 a.m., by T. Dunlop Young, M.R.C.V.S.

Lecture to Commissioned Officers and Professional Men, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S.

12 M. **Whit Monday.** Offices, Museum and Library closed.

16 F. } 17 S. } Examination for Inspectors of Meat and other Foods—London.

16 F. **Sessional Meeting**, Cheltenham, at 7.30 p.m. Discussion on "Aids and Hindrances to the present-day effort to diminish Tuberculosis," by J. H. Garrett, M.D., D.P.H., M.O.H., Cheltenham, and J. Middleton Martin, M.D., D.P.H., County Medical Officer, Gloucester.

17 S. Visits to Abattoirs, School Clinic, Disinfecting Station, etc.

20 T. **Sessional Meeting**, London, at 7.30 p.m. Address on "London's Water Supply," by E. B. Barnard, J.P., M.A., Chairman of the Metropolitan Water Board.

21 W. Visit to King George Reservoir, Chingford. Train leaves Liverpool Street Station for Enfield Lock at 2.51 p.m.

30 F. } 31 S. } Examinations—Belfast.

30 F. **Sessional Meeting**, Chester, at 7 p.m. Discussion on "Methods of Water Purification and Softening," to be opened by J. Parry, M INST.C.E., Chief Engineer, Liverpool Waterworks.

31 S. Visits to Waterworks, etc.

JUNE.

6 F. } 7 S. } Examinations—Leeds.

JULY.

7-12. **Congress and Exhibition**, Exeter. President: The Right Hon. Earl Fortescue, K.C.B. (Lord Lieutenant of Devonshire).

LIST OF MEMBERS AND ASSOCIATES

ELECTED APRIL, 1913.

MEMBERS.

* Marked thus have passed the Examination in Sanitary Science as applied to Buildings and Public Works.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

M Marked thus have passed the Examination of the Institute for Inspectors of Meat and Other Foods.

Reg. No. Date of Election.

3124 1913. Apr. BLACKMAN, John William Bernard, M.CAN.SOC.C.E., P.A.S.I., M.S.A., *City Engineer, New Westminster, British Columbia.*

3133 1913. Apr. *FROST, Arthur Stanley, *Borough Engineer's Office, Durban, Natal.*

3125 1913. Apr. ‡MHUNTER, Harry, *Council Offices, New Malden, Surrey.*

3137 1896. May. HURD, Howard, *Council Offices, Broadstairs, Kent.*

3126 1913. Apr. HURLEY, Frederick Arthur, A.M.INST.C.E., *Assistant Director of Irrigation, Pretoria, Transvaal, South Africa.*

3127 1913. Apr. LAL, Radha, *Consulting Engineer, Lahore, Punjab, India.*

3128 1913. Apr. MAFLIN, Russell, A.I.S.E., *Civil Engineer, Rawal Pindi, Punjab, India.*

3134 1913. Apr. *O'MARA, Thomas Naughton, *Quarter-Master-Sergt., Royal Engineers' Office, Roberts Heights, Pretoria, Transvaal.*

3135 1913. Apr. *SHIPLEY, George, *Builder, Marske-by-the-Sea, Yorks.*

3136 1913. Apr. ‡*WADSWORTH, A. E., *Department of Public Health, Office of Chief Health Officer, Hobart, Tasmania.*

3129 1913. Apr. ‡WEBB, Reginald Acheson, P.A.S.I., *Municipal Board, Lagos, Southern Nigeria.*

3130 1913. Apr. WHINCOP, Walter George, A.R.I.B.A., 74, *Filey Avenue, Stoke Newington, N.*

3131 1913. Apr. WODEHOUSE, Robert Elmer, M.D. *(M.O.H.), Provincial Medical Officer of Health, Fort William, Ontario, Canada.*

3132 1913. Apr. ‡YOUNG, Thomas Howard, *Acting Chief Chemist, Laboratory, Canadian Pacific Railway Depot, Winnipeg, Canada.*

ASSOCIATES.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

S Marked thus have passed the Examination in School Hygiene, including Elementary Physiology.

V Marked thus have passed the Examination of the Institute for Women Health Visitors and School Nurses.

Reg. No. Date of Election.

6123 1913. Apr. ‡BARRASS, Samuel, *Hagworthingham, Spilsby, Lincs.*

6124 1913. Apr. ‡BEATTIE, Richard, 67, *Minors Street, Johannesburg, Transvaal.*

6125 1913. Apr. ‡BECKWITH, Louis Frederic, *Waterloo House, Gayton, King's Lynn, Norfolk.*
6126 1913. Apr. ‡BLAKER, J., *P.O. Box 1049, Johannesburg, Transvaal.*
6127 1913. Apr. ‡BLOCK, Miss Cicely Lavinia, *Crane Hill House, Ipswich.*
6128 1913. Apr. ‡CRIPPS, Harry, *High Street, Winslow, Bucks.*
6129 1913. Apr. ‡DENNY, James Sydney, 68, *Great Western Road, Bayswater, W.*
6130 1913. Apr. ‡DRUMMOND, William Alexander, 30, *New Road, Basingstoke.*
6131 1913. Apr. ‡EVANS, Walter Edmund, *P.O. Box 1049, Johannesburg, Transvaal.*
6132 1913. Apr. ‡FRASER, Andrew Clark, 126-7*th Avenue, Bezindenhout Valley, Johannesburg, Transvaal.*
6121 1913. Apr. GROVES, Edwin Day, *Surveyor, Water Engineer, and Sanitary Inspector, St. Austell, Cornwall.*
6151 1911. Mar. ‡HENDERSON, Stanley Robert, *Sanitary Offices, Town Hall, Eastbourne.*
6133 1913. Apr. ‡HUTCHINSON, James, *New Arcade, Horsforth, near Leeds.*
6134 1913. Apr. *v*JACKSON, Miss Dorothy Grierson, 14, *Wellington Road, Brighton.*
6135 1913. Apr. ‡JACKSON, George William, 39, *Lawrence Road, Kimberley, S. Africa.*
6136 1913. Apr. ‡JOHNSTON, James, *Sanitary Inspector, Blenheim, Marlborough, N. Zealand.*
6137 1913. Apr. *s*LOCK, Robert, F.R.H.S., *Gaunts, Wimborne, Dorset.*
6138 1913. Apr. *s*LOXDALE, Miss F. Joyce, *The Training College, The Close, Salisbury.*
6139 1913. Apr. ‡MEARS, Alfred Thomas, 38, *All Saints Rd., Ipswich.*
6140 1913. Apr. ‡MEGENEY, Ronald R. J., *The Gables, London Road, Dorking.*
6141 1913. Apr. ‡MORGAN, John, 120 *Constitution Street, Cape Town, S. Africa.*
6142 1913. Apr. ‡NASH, Frederick Charles, 3, *West St., Chichester.*
6122 1913. Apr. PANTHER, Miss Olive Janet, 11, *Beulah Road, Walthamstow, Essex.*
6143 1913. Apr. *v*PENTY, Miss Ellen, 96, *Otley Road, Leeds.*
6144 1913. Apr. ‡SCRYMGEOUR, William Kincaid, *District Road, Mornington, Dunedin, New Zealand.*
6145 1913. Apr. SISTERTON, Miss Eveline, *Public Health Dept., Johannesburg, Transvaal.*
6146 1913. Apr. ‡WALLACE, Charles, 151, *Kitchener Avenue, Bezindenhout Valley, Johannesburg, Transvaal.*
6147 1913. Apr. ‡WATSON, W. C., *Box 4794, Johannesburg, Transvaal.*
6148 1913. Apr. ‡WELCH, Ebenezer, *Box 6598, Johannesburg, Transvaal.*
6149 1913. Apr. ‡WILSON, Frank, 11, *Ruess Street, Newcastle, New South Wales.*
6150 1913. Apr. ‡WORTLEY, Harold, *Tolverne, Malton Road, York.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY.

April, 1913.

*** *For Publications of Societies and Institutions, etc., see under "Academies."*

ACADEMY (British).

London. *Board of Agriculture and Fisheries.* Agricultural Statistics, 1912. Returns of the Produce of Crops in England and Wales. Vol. XLVII., Part II. 73 pp., 8vo. London, 1912. *The Board.*

ACADEMY (Colonial).

Toronto. *Canadian Institute.* Transactions for November, 1912. Vol. IX., Part III. 207 pp., 8vo. Toronto, 1912. *The Institute.*

Chesser, *Elizabeth S., M.B.* Perfect Health for Women and Children. 276 pp., 8vo. London, 1912. *The Author.*

Departmental Committee on Tuberculosis. Final Report. Vols. I. and II. 220 pp., 8vo. London, 1913. *Purchased.*

Glasgow. Report upon the Study of the Diet of the Labouring Classes in the City of Glasgow. 97 pp., 8vo. Glasgow, 1913.
A. K. Chalmers, M.D., D.P.H.

Hanna, *Wm., M.D., D.P.H.* Studies in Smallpox and Vaccination. 52 pp., 8vo. London, 1913. *Messrs. John Wright & Sons, Ltd. (publishers).*

Local Government Board. The Housing of the Working Classes Act, 1890–1910. 6 pp., fcp. London, 1913. *The Board.*

——— Statistics of Incidence of Notifiable Infectious Diseases in each Sanitary District in England and Wales, and Preliminary Statement as to Smallpox, Plague, and Cholera during the Year 1912. New Series, No. 78. 77 pp., 8vo. London, 1913. *A. Newsholme, M.D., F.R.C.P.*

London County Council. Annual Report of the Council, 1911. Vol. III. 193 pp., fcp. London, 1913. *The Council.*

Macdonald, *Angus, M.D., D.P.H.* Is Yellow Fever Endemic in Jamaica? 17 pp., 8vo. Jamaica, 1913. *The Author.*

Prout, *W. T., M.B.* Lessons on Elementary Hygiene and Sanitation. 184 pp., 8vo. London, 1913. *Messrs. J. & A. Churchill (publishers).*

Scotland, Registrar-General. Report of the Twelfth Decennial Census. Vol. I., Part 37, County of Wigtown. 38 pp., fcp. London, 1913.
J. Patten MacDougall, C.B. (Registrar-General).

Sturrock, *W. D.* First Principles of Hygiene. 256 pp., 8vo. Oxford, 1912.
The Clarendon Press (publishers).

West Riding Rivers Board. Report upon the Eighth Report of the Royal Commission on Sewage Disposal, 1898. 20 pp., 8vo. Wakefield, 1913.
H. Maclean Wilson, M.D., B.Sc.

THE ROYAL SANITARY INSTITUTE.

FOUNDED 1876.

ANNUAL REPORT OF THE COUNCIL FOR THE YEAR 1912.

Read at the Ordinary General Meeting, April 23rd, 1913.

INTRODUCTION.

The Institute has now been established in its new premises for three complete years, and it will be of interest to the Members to note the progress that has been made during this period. Not only has the Membership steadily increased, but the general status of the Institute has advanced, and there has been a considerable development in all branches of the Institute's work, and in its extension to other parts of the Empire.

Among the special features of the work during 1912 may be noted the second visit of the Institute to the City of York for a Congress and Exhibition. On this occasion His Royal Highness Prince Arthur of Connaught graciously favoured the Institute by becoming Patron of the meeting and by opening the Exhibition; and His Grace the Archbishop of York accepted the Presidentship of the Congress, and opened the meeting with a comprehensive and stimulating Address covering the field of sanitary endeavour.

It may also be noted that an Exhibition was held in the Museum, of Models and Plans illustrating methods of construction of economical forms of Sanatoria and other temporary buildings, and in connection with this Exhibition a series of afternoon Lectures was given.

The Museum has been steadily developed, and the Council gratefully acknowledge the assistance given in this work by the funds which were placed at their disposal by the British Committee of the International Hygiene Exhibition, Dresden.

SANITARY LEGISLATION.

The Parliamentary Committee had before them during the year a number of Bills bearing more or less directly upon the Public Health, and several petitions were presented to Parliament with regard to these Bills.

The following is a summary of the action taken, and the fate of each Bill is noted.

Petitioned in favour of:—

Factory and Workshop (Lords). A Bill to make the Act of 1901 applicable to Men's Workshops in like manner as to other Workshops. The Bill was withdrawn.

Factory and Workshop (No. 2) (Lords). A Bill to control the use of underground premises as Factories and Workshops. The Bill was dropped.

Public Health (Sewers and Drains). Dropped.

Housing of the Working Classes. A Bill to provide for the better application and enforcement of the Housing of the Working Classes Acts. The Bill was dropped.

Mental Deficiency. A Bill to make further and better provision with respect to Feeble-Minded and other Mentally Deficient persons. The Bill was withdrawn.

Petitioned against:—

Vaccination Acts (Repeal). Dropped.

Housing, Town Planning, &c., Act, 1909 (Amendment). Dropped.

The following Bills were also considered, but no action was taken:—

Meat Markets (Ireland). Dropped.—Feeble-Minded Persons (Control). Dropped.—Inebriates. In Committee.—Diseases of Animals Consolidation. Dropped.—Mental Defect. Dropped.

Representations were made to the Home Secretary urging him to introduce legislation in regard to Feeble-Mindedness; and, after the Government Mental Deficiency Bill had been introduced, a communication was sent to the Home Secretary with regard to one or two matters affecting its administration.

SESSIONAL MEETINGS.

Meetings were held in London in March and November, and during the year in the following provincial centres:—Nottingham, Manchester, Cardiff, Blackpool, Torquay, Lewes, Alton, Doncaster. At these meetings the attendance ranged from 40 to 200.

Among the subjects discussed at the Sessional Meetings were the Report of the Departmental Committee on Intercepting Traps;

Tuberculosis and Sanatorium Benefits under the Insurance Act; Control of Tuberculosis as practised in the town of Lewes; The New Sewage Scheme for Lewes with special reference to the discharge of effluents into Tidal Streams: Housing Problems in County Areas; Municipal Work in Alton; Town Planning in relation to the development of the South Yorkshire Coal-field; Local Public Health Administration and the Insurance Act; The Application of the Housing and Town Planning Act to the development of suburban Areas now in Transition; The Quantity of Water available from Upland drainage areas; The Development of Cardiff Waterworks; The Card Index System as applied to Public Health Work; and the Joint Scheme of Sewerage for Thornton-le-Fylde, Bispham-with-Norbeck, and Carleton.

These meetings, particularly in Provincial Centres, afford a useful opportunity for members of the Institute to meet and discuss problems of sanitary interest. They are much appreciated by Members and Associates, and are well attended. A full record is given in the Journal.*

The Council are indebted to Dr. P. Boobbyer, Prof. J. Radcliffe, Dr. E. Walford, Mr. John S. Brodie, Mr. H. A. Garrett, Dr. Steinhaeuser, Mr. G. Bertram Hartfree, and Dr. A. B. Dunne, who acted as Honorary Local Secretaries, and rendered valuable assistance in organising and arranging these meetings.

They have also to express their thanks to the Mayor and Mayoress (Councillor and Mrs. C. T. Towell) and the Corporation of Torquay: Dr. Hugh Stott (Mayor of Lewes); the Mayor and Corporation of Doncaster; the Lord Mayor and Corporation of Cardiff; Messrs. Batchelor and Councillor Glover; the Alton District Council and Dr. Gauvain (Medical Superintendent, Lord Mayor Treloar's Cripples Home); Messrs. Crowley & Co.; Messrs. Courage & Co.; Messrs. Bayley & Co.; the Corporation of Manchester; Mr. J. Kirkland; Mr. C. H. Priestley, M.INST.C.E.; Mr. A. Hindle, M.INST.C.E.; Mr. E. Frobisher, A.M.INST.C.E.; and the Fleetwood District Council, for entertaining the Members, providing accommodation for the meetings, or for affording facilities for the visits which formed such an instructive and interesting feature of these meetings.

ASSOCIATES' MEETING.

The Annual Meeting of Associates was held on March 26th, when Mr. H. Percy Boulnois gave an Address on "Sanitary Legislation and Education."

LECTURES AND DEMONSTRATIONS.

Seven Courses of Instruction were conducted during the year, four in the Spring and three in the Autumn. The Courses were as follows: for Sanitary Officers, 70 Students; for Meat Inspectors, 47 Students; Food and Meat Inspection for Commissioned Officers and Professional Men, 16 Students; in Hygiene in its bearing on School Life and for Women Health Visitors and School Nurses, 59 Students. The total number of Students for the year was 192.

The Council endeavour to make the Course of Training for Sanitary Officers as complete as possible for the Students. It consists of Lectures given at the Institute and Visits arranged under competent guidance to public works of sanitary interest; the students also have the use of the Library and the Reading Room, and the museum of Sanitary Appliances, where the exhibits are explained and demonstrated to them before each of the Lectures.

The Institute is indebted to the authorities and officers of the Works visited, both public and private, for their assistance in affording facilities and in conducting Students over the various Works illustrative of Sanitary Practice and Administration.

Lists of the Lectures were given in the Calendar in the Supplement to the Journal.

LECTURE TO THE INSTITUTE.

The Lecture was delivered by F. W. Mott, M.D., F.R.S., on "Sanity and Insanity," on Wednesday, April 24th.

EXAMINATIONS.

During the year Examinations were held at a number of centres in the United Kingdom, as set out below:—

Birmingham (2)	Hull	Norwich
Bristol	Leeds (2)	Plymouth
Cardiff (2)	Leicester	Preston
Dublin	Liverpool (3)	Salisbury
Edinburgh	London (4)	Sheffield
Glasgow	Manchester (2)	York
Hereford	Newcastle-upon-Tyne	

At these Examinations 119 candidates presented themselves for the Sanitary Science Examination, to 53 of whom certificates were granted; 115 candidates presented themselves for the Examination in School Hygiene, to 82 of whom certificates were granted; 200

candidates presented themselves for the Women Health Visitors Examination, to 113 of whom certificates were granted; 590 candidates presented themselves for the Inspectors of Nuisances Examination, and 301 were certified competent as regards their sanitary knowledge to discharge the duties of an Inspector of Nuisances under the Public Health Act, 1875; 3 candidates presented themselves for the Inspectors Examination Qualifying for Membership, to 2 of whom certificates were granted; and 172 candidates presented themselves for the Examination for Inspectors of Meat and other Foods, to 98 of whom certificates were granted.

It was urged upon the Council that there is a need for some certificate of qualification for the post of Smoke Inspector, such as would indicate a practical as well as a theoretical knowledge in those subjects which it is necessary that an Inspector should be cognisant of in order satisfactorily to carry out the duties. In order to meet this demand, and to afford an opportunity to Inspectors in office and others of obtaining an evidence of qualification in the practical and administrative duties of this position, the Council decided to institute a special examination and to award certificates.

Examinations were established by the Institute in 1877, and the following figures show the total number of Examinations held and the number of candidates:—

	Examinations.	Candidates entered.	Candidates certified.
For Local Surveyors	35	291	142
Sanitary Surveyors, India	3	71	40
Sanitary Science as applied to Buildings and Public Works	269	1,482	612
School Hygiene, including Elementary Physiology	115	652	427
Women Health Visitors and School Nurses	90	709	417
Inspectors of Nuisances	417	15,496	7,985
Inspectors qualifying for membership ..	20	20	12
Inspectors of Meat and other Foods ..	88	1,463	899
	1,037	20,184	10,534

The Sanitary Inspectors Examination Board (formed by The Royal Sanitary Institute and other bodies), for holding Examinations under the Public Health (London) Act, 1891, held 3 Examinations during the year. There were 38 certificates granted. A supplementary Examination was also held in the special subject of Meat Inspection, 2 certificates being awarded.

CONGRESS AND EXHIBITION AT YORK.

The Twenty-seventh Congress and Exhibition of the Institute was held at York from July 27th to August 3rd, under the Presidency of His Grace the Lord Archbishop of York.

The numbers attending the Congress were as follows: Delegates, 550, representing 375 Sanitary Authorities and Learned Institutions; Members and Associates of the Institute, 375; Associates of the Congress and other Subscribers, 125; Complimentary and Press, 100; making a total of 1,150.

Many subjects of special interest were brought forward and discussed. The greater part of the Addresses, Papers, and Discussions are published in Vol. XXXIII. of the Journal, and they will be continued in the next Volume.

The Exhibition, opened by H.R.H. Prince Arthur of Connaught, K.G. (Patron of the Congress), was held in the Exhibition Buildings from July 27th to August 3rd. An Address was presented to His Royal Highness by the Council, which is published, with the printed reply, in the Journal, Vol. XXXIII., p. 285. A list of the exhibits to which medals were awarded was given in the Supplement to Vol. XXXIII., and an illustrated list appeared in the same Volume.

In order to add to the educational value of the Exhibition a number of exhibits were lent by the Leeds University, medical officers of health, and others, illustrating Public Health work, and a series of lecturettes was given in the Exhibition dealing with the following subjects from a popular point of view:—Garden Cities, by Mr. F. E. Fremantle, M.B.; Care of Consumption, by Dr. John Robertson; House Drainage, by Mr. W. C. Tyndale; Schools for Mothers, by Dr. Philip Boobbyer; The Health of Factory Workers, by Prof. T. Eustace Hill, M.B.

SPECIAL COMMITTEE ON THE PURIFICATION OF WATER IN SWIMMING BATHS.

A good deal of interest has been aroused recently by the introduction of methods for the purification of water in swimming baths, and as it seemed a matter of public importance a Special Committee was appointed by the Institute to investigate the question. This Committee, after collecting information and visiting places where systems for purification were installed, submitted a report on the subject. The report is published in the Journal, Vol. XXXIV., page 77.

LIBRARY.

Volumes and Pamphlets to the number of 512 have been added to the Library, and lists of these have been published in the Supplement. A catalogue of the Library is in preparation, which it is hoped will shortly be printed.

An arrangement is in operation by which Members and Associates can obtain books on loan.

JOURNAL.

The Journal for 1912 consisted of 662 pages, in addition to 216 pages of supplemental matter.

It contained records of the Lectures and Sessional Meetings held in London and in provincial centres; articles by members; and the greater part of the papers and discussions at the York Congress.

The Supplement contained, in addition to the Annual Report, reviews of books, lists of members and associates elected during the year, results of examinations, the calendar, an illustrated list of awards made at the Exhibition at York, and other notices of current interest relating to the work of the Institute.

Papers on sanitary subjects in their relation to Colonial Public Health Administration have from time to time been published in the Journal, and the Congress held in South Africa in 1911 was made the occasion for the publication of a Colonial Supplement, as a corollary of the steady development in the work of the Institute in all parts of the Empire. Besides the papers and discussions at this meeting, the supplement contained papers sent from British Guiana, from Western Australia, and from Canada.

PARKES MUSEUM.

The re-arrangement of the Museum has been steadily proceeded with, and many additions have been made to the several sections. A new section has been formed dealing with Flies and Human Parasites, and a Catalogue relating to this section has been published, and is now on sale to Students and others. This forms the second part of the Sectional Catalogue of the Museum.

In the Drainage Section a new exhibit has been presented, showing an arrangement of iron pipes and fittings for house drainage purposes.

The collection of Lantern Slides which is available for the use of Members and others has been largely added to during the year, and considerable use has been made of the slides for lecture purposes.

A large number of the Training Institutions in the neighbourhood of London again made use of the facilities afforded by the Museum for the training of their Students in matters relating to hygiene and sanitation. Students to the number of 1,186 visited the Museum in organised classes from the following 39 institutions:—

University of London—
- Bedford College for Women.
- East London College.
- King's College, London.
- King's College for Women.
- London Hospital Medical School.
- London School of Medicine for Women.
- St. George's Hospital Medical School.
- St. Thomas's Hospital Medical School.
- University College, London.

L.C.C. Science and Art Schools—
- Blackheath Road.
- Brownhill Road.
- Clapham.
- Essendine Road.
- Hackney.
- Lavender Hill.
- London School of Building.
- Myrdle Street.
- Thomas Street.
- William Street.

Architectural Association.
Aske's School (Haberdashers Co.)
Battersea Polytechnic.
Bedford Physical Training College.
Clapham County Secondary School.
Clapham High School for Girls.
East Ham Technical College.
Home and Colonial Training College.
Hounslow Institute.
Kent C.C. Domestic Economy School, Bromley.
Kew Road Technical Institute.
National Health Society.
National Society's Training College, West Hampstead.
National Training School of Cookery.
Queen Victoria Jubilee Institute for Nurses.
Regent Street Polytechnic.
Richmond and Barnes Institute.
Royal Naval Medical College.
St. Christopher's Nursing Home, Tunbridge Wells.
West Ham Municipal Technical Institute.

SANATORIA EXHIBITION.

An Exhibition of Models and Plans illustrating methods of construction of economical forms of Sanatoria and other temporary buildings was held in the Museum in January, and was open for a month. The collection was exhibited in order to call attention to the efforts that are being made to provide some simple and inexpensive form of building, and in view of the provisions of the Insurance Act, the Committee considered that the typical forms of shelters illustrated among the plans and models would be found suggestive to local authorities and others. The exhibits included models and drawings of buildings in England, Scotland, and Ireland,

and also plans and pictures of different shelters and sanatoria in Canada, Germany, and the United States. The President of the Local Government Board, the Rt. Hon. John Burns, the Medical Officer, Dr. Newsholme, and the Assistant Secretary to the Board, Mr. Willis, visited the Exhibition.

In connection with the Exhibition a series of Popular Lectures was arranged dealing with the following branches of the subject:—Fresh Air, by Prof. H. R. Kenwood; the Problem of After Care of Sanatoria Patients, by Dr. T. D. Lister; the Employment of Patients in Sanatoria, by Mr. M. S. Paterson, M.B., L.R.C.P.; Anti-Tuberculosis Dispensaries, by Dr. D. J. Williamson; and Open-air Schools, by Prof. Ralph Williams.

HENRY SAXON SNELL PRIZE.

The subject set in 1912 for the Essay in competition for this Prize was "The Ventilating, Lighting, Heating, and Water Supply Appliances and Fittings for an Operating Room for a General Hospital."

Ten Essays were sent in, and they were brought under the consideration of the Council.

The Adjudicators for the Competition were Mr. Edwin T. Hall, F.R.I.B.A., Dr. Louis C. Parkes, and Mr. A. Saxon Snell, F.R.I.B.A.; and they had the advantage of the very valuable criticisms and suggestions made by Sir Frederick Treves, Bart., G.C.V.O., who kindly acted as Consulting Referee.

Acting upon the advice of the Adjudicators and of the Consulting Referee, the Council divided the Prize of Fifty Guineas, giving one half the sum to Mr. John Darch, M.R.San.I. (Wandsworth), writing under the motto "Aseptos," and the other half to Mr. H. F. V. Newsome (Manchester) and Mr. John G. Cherry, M.R.San.I. (Manchester), writing jointly under the motto "Magnum Bonum."

A Bronze Medal of the Institute was awarded to each of the successful competitors.

The Essays sent in under the following mottoes were commended by the Adjudicators:—"Science moves but slowly, slowly creeping on from point to point"; "Ajax"; "Tout bien ou rien."

COLONIAL BRANCHES.

In several British Dominions where the number of Members and Associates is sufficiently large, there are Branches of the Institute actively at work promoting the advancement of Sanitary Science.

During 1912, a Branch was sanctioned for the Dominion of New Zealand, where there is a growing membership. The other Branches are in Western Australia and South Africa. By reason of this widespread Colonial work, the Institute has been able to be of assistance to many of the Members and Associates who have gone abroad, by giving them introductions to Members and Officials of our Branches, which have been instrumental in helping them to find suitable appointments, or in other ways have furthered their interests in the Colony.

Western Australia.

The year's work in this State has been marked by the holding of a General Public Health Congress in Perth, the first meeting of its kind to be held in the Commonwealth of Australia. In the organization of this meeting, several scientific and professional bodies were associated, and the Officers of the Branch took a prominent part in the arrangements and in the proceedings.

The Congress was held in the new buildings of the Department of Public Health, Perth, from Oct. 1st to 4th, and the proceedings were opened by the Patron of the Branch, His Excellency the Governor of the State. The organisers of the Congress are proposing to publish the proceedings.

The total membership of the Branch at the end of 1912 was 65.

South Africa.

The Committee of this Branch have been actively engaged in preparing for the second Sanitary Congress, to be held in Johannesburg. The meeting has had to be postponed for local reasons, but it is now definitely arranged for March 10th to 12th, 1913.

There has been an increase in the number of Members and Associates connected with the Branch, there being now over 100 on the books.

New Zealand.

A new Branch of the Institute was authorised for the Dominion of New Zealand during the year, and the organisation is in progress. As a consequence there has been a marked increase in the number of Members and Associates in New Zealand; the total number at the end of the year being 46.

COLONIAL EXAMINATIONS.

During the year Examinations were held by the Institute in—

Adelaide	Dunedin	Pretoria
Auckland	Hong Kong	Sydney
Bombay	Hobart	Wellington
Brisbane	Melbourne	Winnipeg
Cape Town	Perth & Kalgoorlie (2)	

The Council have again to express their great appreciation of the services rendered by the Members and Officers of the Colonial Examination Boards in supporting the educational work and aims of the Institute in the various parts of the Empire.

The Council will be glad of the help of Members in the Colonies in making the Examinations better known in each centre.

Indian Empire.

An Examination for Sanitary Surveyors, India, was held in July by the Institute in co-operation with the Government of Bombay Presidency; 29 candidates presented themselves, and 17 were granted certificates.

Canada.

An Examination was held in Winnipeg in August; 2 candidates presented themselves for the Inspectors of Nuisances Examination to whom certificates were granted.

New South Wales.

An Examination was held in Sydney in December, when 3 candidates presented themselves for the Sanitary Science Examination, 1 certificate being granted; 38 candidates presented themselves for the Inspectors of Nuisances Examination, 22 certificates being awarded.

Western Australia.

Examinations were held in Perth and Kalgoorlie in January and in Perth in August. At the former 11 candidates entered for the Inspectors of Nuisances Examination, and 6 certificates were granted; 5 candidates took the Meat Inspectors Examination, and 3 certificates were granted. At the August Examination there were 2 candidates for the Sanitary Science Examination, 1 certificate being granted; 8 candidates for the Inspectors of Nuisances Examination, 5 certificates being granted; and 2 candidates for the Meat Inspectors Examination to whom certificates were granted.

SOUTH AUSTRALIA.

An Examination was held in Adelaide in December; 13 candidates presented themselves for the Inspectors of Nuisances Examination, and 3 certificates were granted.

QUEENSLAND.

An Examination was held in Brisbane in November. 4 candidates entered for the Sanitary Science Examination, and 2 certificates were awarded; 4 candidates presented themselves for the Inspectors of Nuisances Examination, 2 certificates being granted.

VICTORIA.

The first Examination arranged by the Board was held in Melbourne in November; when 41 candidates presented themselves for the Inspectors of Nuisances Examination, and 22 were awarded certificates.

Mr. Donald Clark, Dr. J. Jamieson, Dr. Harvey Sutton, and Dr. W. A. Wood have been elected additional members of the Board, and Mr. J. W. Mellis was appointed as Assistant Honorary Local Secretary of the Board.

TASMANIA.

An Examination was held in Hobart in December, but the accounts were not received in time to include the figures in this report.

NEW ZEALAND.

Examinations were held in June at Wellington and Dunedin, and at Auckland in December. 9 candidates presented themselves for the Sanitary Science Examination, 5 certificates being granted; 30 candidates presented themselves for the Inspectors of Nuisances Examination, 19 certificates being granted.

Mr. W. H. Morton, Mr. E. Cuthbert, and Dr. Champtaloup have been elected additional members of the Board.

BRITISH SOUTH AFRICA.

Two Examinations were held during the year, in Cape Town and Pretoria. At the Pretoria Examination in June, 9 candidates entered for the Sanitary Science Examination, 3 certificates being granted; and 10 candidates presented themselves for the Inspectors of Nuisances Examination, 4 certificates being granted. At the Cape Town Examination held in November, 2 candidates entered for the Sanitary Science Examination, but no certificates were granted; and 13 candidates took the Inspectors of Nuisances Examination, 8 certificates being granted.

Hong Kong.

An Examination for Inspectors of Nuisances was held in Hong Kong in July. 6 candidates presented themselves, and 3 certificates were granted.

Dr. J. Bell, Dr. J. W. Hartley, and Mr. A. F. Churchill have been elected additional Members of the Board.

ASSOCIATED WORK.

The International Hygiene Exhibition, which was held at Dresden in 1911, was particularly noticeable for the explanatory method adopted for illustrating the various branches of Science that came under its scope. The Committee of the British Section had to work under exceptional difficulties, and deserve much credit for the great success achieved. They were also fortunate in so arranging their expenditure as to have a balance in hand, which they generously devoted to the Parkes Museum, as being an institution kindred in its objects to the educational work of the Dresden Exhibition. The total amount of the balance voted was £291 2s. 6d., but a suggestion was made by the British Committee that a portion of this amount might be passed on to the National League for Physical Education and Improvement, and in accordance with this suggestion a sum of Fifty Guineas was sent to the National League.

During 1912, the Institute has been referred to by the Colonial Office, the Crown Agents for the Colonies, and other Bodies, to render assistance in making appointments of Sanitary Officers, including appointments on the Gold Coast, in the Malay States, and in British Guiana.

The Federal Government of Australia applied to the Institute in the latter part of the year to aid them by making a collection of sanitary models and appliances that would be useful in forming a teaching Museum for training candidates for examination in Australia. The intention was to have these models and appliances in use for some time in one State of the Commonwealth, and then for them to be transferred for a period to another of the States. Funds were voted by the Federal Government for this purpose, and a very extensive and useful collection of exhibits was obtained, many of them being presented or specially prepared by manufacturers and others in the United Kingdom. It was arranged that this teaching collection should be sent to Australia in time to form part of a Health and Hygiene Exhibition which was being organised by the Australian Native Association in Melbourne in January, 1913.

FINANCE.

The Statement of Accounts shows a satisfactory improvement on last year. Although the general expenses have increased with the steady growth of the Institute and its work, the receipts from various sources have increased to a larger degree, and the account shows a balance of income over expenditure of £300.

The financial position of the Institute has been relieved by the determination of the liabilities accruing for dilapidations with regard to the old premises in Margaret Street.

The expenditure on the several developments made in the Museum has been met out of funds voted to the Institute by the British Committee of the Dresden International Hygiene Exhibition, and there still remains in hand a balance of £128 for further improvements which are in progress.

The Accumulated Fund shows a total credit balance of £17,253 9s. 10d. The assets consist partly of the premises, the contents of the library and the museum, and the furniture, and partly of invested funds: this latter item amounts to £2,446 11s. 0d.

OBITUARY.

It is with regret that the Council have to report the death of a number of those associated with the Institute, as follows:—

Hon. Fellows: Dr. D. Finkler, A. Herzberg, Dr. W. Köhler. *Fellows:* Lewis Angell, John T. Eayrs, Sir Herbert M. Ellis, Sir Robert Pullar, Dr. C. Theodore Williams. *Members:* Edwin Ault, Lt.-Colonel R. B. Bradshaw, J. Wright Clarke, Frank Cowtan, A. E. Jones, Dr. John Knight, R. L. Maitland, E. Mohun, Dr. A. B. D. Seth, Dr. Donald Steel, A. Whitcomb, W. J. G. Wreford. *Associates:* John Cruden, Charles W. Evington, A. Fort, H. Glover, J. Hewitt, J. T. Hopkins, H. Lemmoin-Cannon, G. L. Miller, William J. Press, Henry C. Soper, Miss E. Tregenza.

EPITOME OF REGISTERS OF MEMBERS AND ASSOCIATES.

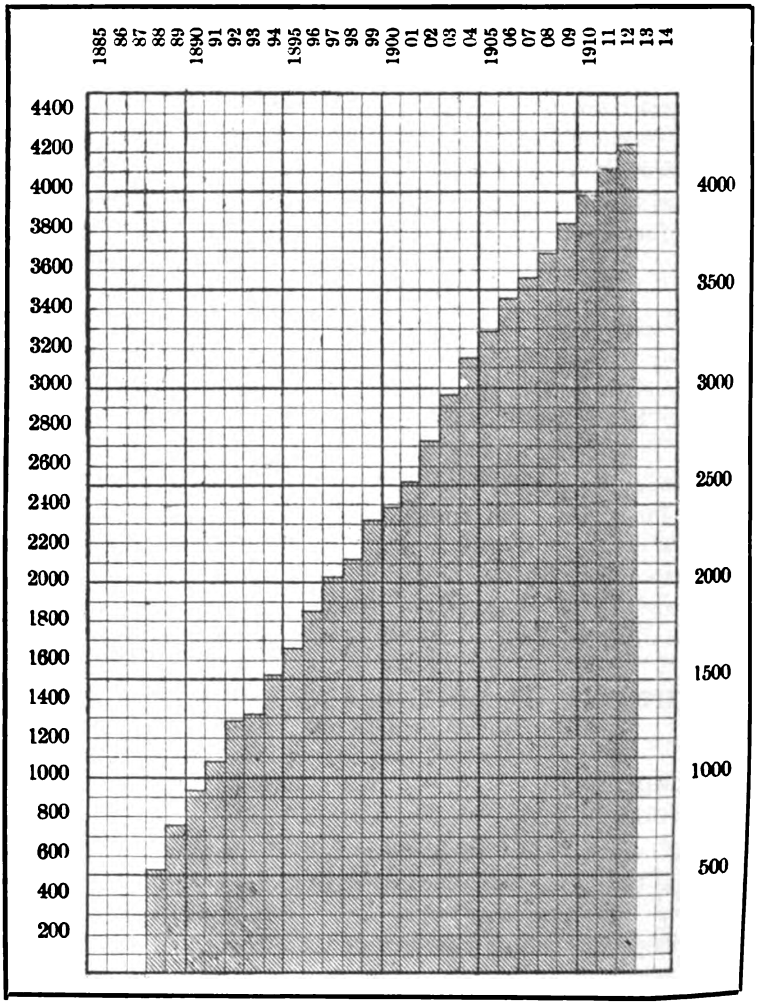
	Hon. Fellows.	Fellows.	Members.	Associates.	Total.
Dec. 31st, 1911 ..	53	262	1,640	2,154	4,109
Dec. 31st, 1912 ..	55	272	1,745	2,185	4,257

With respect to the Membership roll, the progress of the Institute has been well maintained, the net increase in the number of Members and Associates being 148. While the Institute still keeps its place as a body representing those engaged in all branches

of Public Health Work in Great Britain, it is interesting to note the strengthening of the Membership, and the consequent growth of work and influence, in other parts of the British Dominions. This growth is particularly marked in the case of India, where there are now 168 Members and Associates, and of course those Dominions in which Branches are already established have a large representation.

DIAGRAM OF GROWTH IN TOTAL MEMBERSHIP.

Diagram showing the growth in the total membership of the Institute.



EPITOME OF THE WORK OF THE INSTITUTE, 1912.

London Meetings and Examinations.

		Total Attendance
5	Sessional Meetings, Lecture to Institute, etc.	505
4	Lectures during Sanatoria Exhibition	240
124	Lectures and Demonstrations, Sanitary Officers, and School Hygiene and Women Health Visitors' Courses	4,374
30	Lectures and set Demonstrations on Meat Inspection, not including general instruction at the Cattle Market	597
10	Examinations in Sanitary Science, in School Hygiene, for Women Health Visitors, for Inspectors of Nuisances, and for Inspectors of Meat	359
189	Council, Committee, and Ordinary General Meetings, and Associates' Annual Meeting	999
99	Classes brought to Museum	1,186

Congress and Exhibition at York.

8	Sectional Meetings	590
6	Meetings of Conferences	405
3	Addresses and Lectures	1,550
	Exhibition open for seven days	9,029

Provincial and Colonial Meetings.

8	Sessional Meetings	728
104	Examinations in Sanitary Science, in School Hygiene, for Women Health Visitors, for Inspectors of Nuisances, for Inspectors Qualifying for Membership, and for Inspectors of Meat	1,081
	Public Health Congress at Perth (four days).	

H. PERCY BOULNOIS,
Chairman of Council.

E. WHITE WALLIS,
Secretary.

April 8th, 1913.

Appended to this Report (p. 76) is a Memorandum on the working of the Institute for the first three years in its New Premises at 90, Buckingham Palace Road, 1910–12

STATEMENT of INCOME and EXPENDITURE

Dr. EXPENDITURE.

	£	s.	d.	£	s.	d.
Establishment Charges:—						
To Ground Rent, Rates, Taxes, and Insurance	455	2	10			
„ Salaries and Wages	1,983	11	4			
„ Thrift and Benefit Scheme	161	3	4			
„ Coals, Lighting, and Care of Offices	190	11	7			
„ Repairs and Alterations	87	1	5			
„ Library, Binding, &c.	7	12	2			
„ Postage, Telegrams, Telephone & Carriage	527	7	1			
„ Printing, Stationery, and Advertising	394	13	10			
„ Incidental Office Expenses	93	0	1			
„ Office Furniture	19	18	1			
„ Sinking Fund	50	0	0			
				3,970	1	9
Special Expenses, exclusive of Establishment Charges:—						
To Journal and Publications, Cost of Printing, etc., less Sales and Advertisements	479	4	1			
„ Sessional and other Meetings	106	12	11			
„ Lectures, Sanitary Officers and others	466	2	6			
„ Examinations	1,843	16	0			
„ „ Colonial	524	2	1			
„ Congress at York	443	9	1			
„ Exhibition at York	615	2	11			
„ Colonial Branches	44	18	6			
„ Sanatoria Exhibition and other Expenses	21	12	2			
				4,545	0	3
Balance carried down				300	8	9
				£8,815	10	9

ACCUMULATED OR

	£	s.	d.
To Depreciation of Investments	110	12	0
„ Dilapidations Account, Margaret Street Premises	182	17	1
„ Balance to be carried forward to next Account	17,253	9	10
	£17,546	18	11

for the Year ended 31st December, 1912.

INCOME. Cr.

	£	s.	d.	£	s.	d.
General Receipts:—						
By Annual Subscriptions, less Arrears written off	3,316	8	2			
„ Interest on Investments, etc.	86	2	11			
				3,402	11	1
Special Receipts:—						
By Lectures, Sanitary Officers and others	538	1	7			
„ Examinations	3,008	11	1			
„ „ Colonial	573	3	10			
„ Congress at York	366	19	1			
„ Exhibition at York	898	8	1			
„ Letting of Rooms	27	16	0			
				5,412	19	8
				£8,815	10	9

RESERVE FUND.

	£	s.	d.
By Balance brought forward from last Account	17,219	11	6
„ Balance transferred from New Premises Fund Account.	26	18	8
„ Income and Expenditure Account, Balance brought down	300	8	9
	£17,546	18	11

NEW PREMISES AND

Dr.

	£	s.	d.
To Expenditure on Equipment and Furnishing, 1912	9	8	4
„ Balance transferred to Accumulated Fund	26	18	8
	£36	7	0

GENERAL BALANCE SHEET,

Liabilities.	£	s.	d.	£	s.	d.
To Fees and Subscriptions paid in advance for 1913	238	11	8			
„ Sundry Creditors	815	11	9			
				1,054	3	5
„ Library Catalogue Account, Balance at Credit thereof	80	0	0			
„ Life Composition Fund, Balance at Credit thereof	810	13	4			
„ Museum Arrangements Fund, Balance at Credit thereof	128	9	6			
				1,019	2	10
„ Balance of Assets over Liabilities				17,253	9	10
				£19,326	16	1

SAXON SNELL

	£	s.	d.	£	s.	d.
To Expenses				63	13	4
„ Balance carried forward to next account..............................				726	14	2
Represented as under :—						
Amount invested in £725 7s. 9d. 3 % Metropolitan Water Board "B" Stock at cost	*700	0	0			
Cash at Bank available for Prizes and Expenses	26	14	2			
	£726	14	2			
				£790	7	6

* N.B.—The market value of this Investment on 31st Dec., 1912, was £582 2s. 6d.

Examined with the Books, Vouchers, and Accounts,
and found correct,

3rd April, 1913.

EQUIPMENT FUNDS.

	Cr. £	s.	d.
By Donations, 1912	36	7	0
	£36	7	0

Further donations have been promised to the amount of £32 1 6

31st DECEMBER, 1912.

ASSETS.	£	s.	d.	£	s.	d.
By Premises, 90 Buckingham Palace Road, as valued at 31st December, 1909				12,944	0	0
" Library and Contents of Museum	1,071	0	0			
" Furniture and Fixtures	807	0	0			
" Stock of Publications	227	8	6			
				2,105	8	6
" Subscriptions in Arrear				459	14	6
" Sundry Debtors				698	7	2
" Cash in hand and on Deposit				672	14	11
" Investments at Market Value on December 31st, 1912:—						
£1,500 0 0 4% New Zealand Stock	1,507	10	0			
£500 0 0 3½% New South Wales Stock	477	10	0			
£510 0 0 3½% New Zealand Stock	461	11	0			
				2,446	11	0
				£19,326	16	1

PRIZE FUND.

	£	s.	d.
By Balance brought forward from last Account	768	10	8
" Interest on Investments, &c.	20	11	6
" Income Tax Rebate	1	5	4
	£790	7	6

WOOD, DREW & Co., Chartered Accountants, } *Auditors.*
W. COLLINGRIDGE.

MEMORANDUM ON THE WORKING OF THE INSTITUTE FOR THE FIRST THREE YEARS IN ITS NEW PREMISES AT 90, BUCKINGHAM PALACE ROAD, 1910–1912.

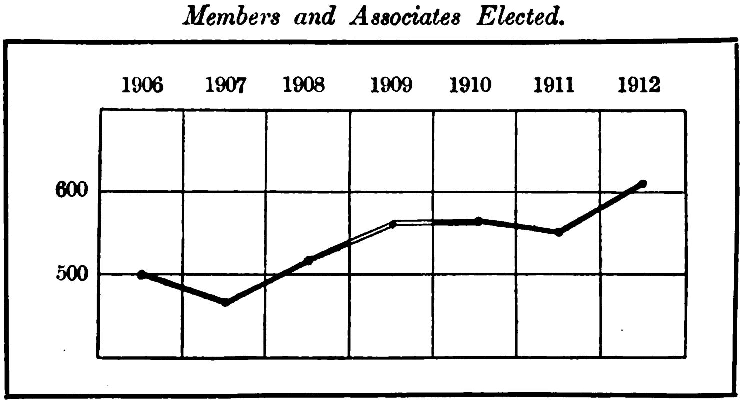
Now that the Institute has completed three years in its new premises, it will be of interest to review the work of these years, and to consider the improved position in which the Institute stands as the result of the opportunities afforded by the larger premises.

For the purpose of comparison two periods have been taken; the first, a period of three years at Margaret Street, immediately preceding the change, and the second, the three years just completed.

MEMBERSHIP.

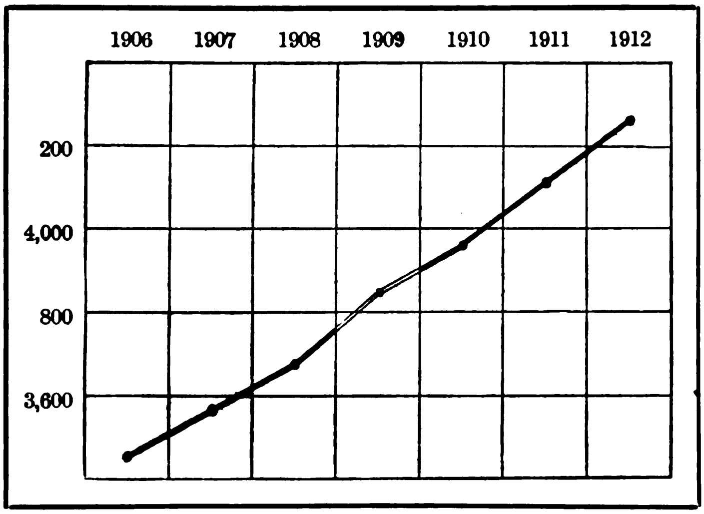
Dealing first with the Membership, which is the basis of the Institute: the total Members and Associates elected in the three years 1906–08 was 1,481, and in the three years 1910–12 it was 1,721. The total elected in 1912 was a record number of 606.

Members and Associates Elected.



After allowing for resignations and erasures, the total increase in the roll of the Institute during the first period was 397, and for the second period 418; showing that the increase has been steadily maintained. The total number on the books at the end of December last was 4,257.

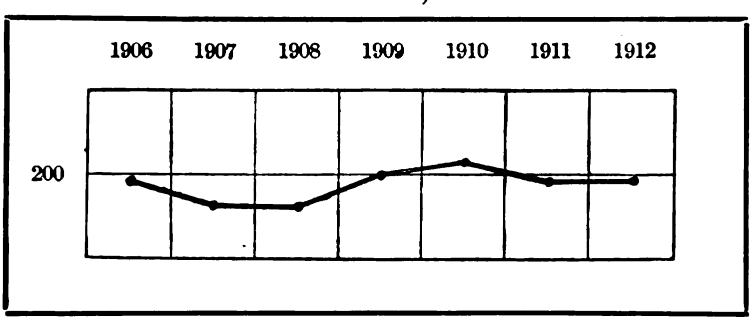
Total Membership Roll of the Institute



STUDENTS AND ATTENDANCES.

The number of students attending the Lectures, and the classes of students brought to the Museum, have been well maintained, and

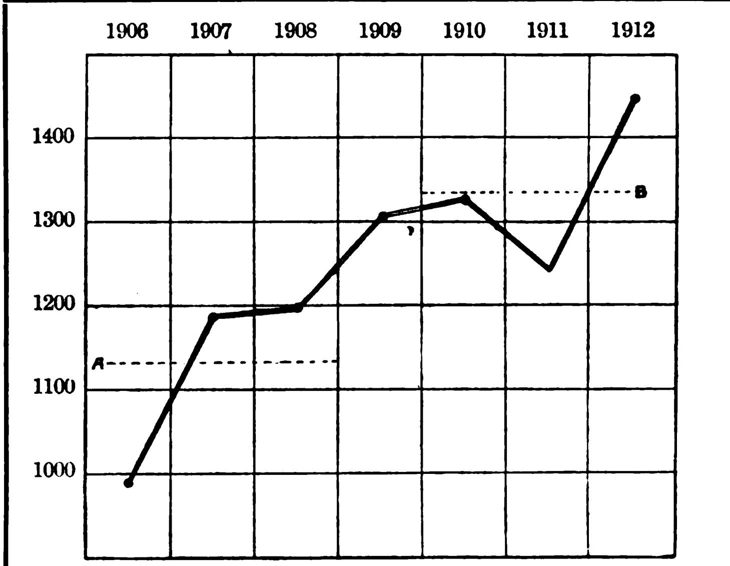
Annual Number of Students.



the various Committee meetings and Lectures at the Institute have been more largely attended, indicating that the present situation of the Institute is a convenient one.

Examination Candidates.

The number of candidates entering for the Examinations was, during the first period 3,375, and during the second period 4,016,



A—Average 1906–8 = 1,125. B—Average 1910–12 = 1,339.

or an average annual total for the second period of 214 higher than during the first period. The number of candidates in 1912, 1,448, was larger than in any previous year.

New Work.

The enhanced status given to the Institute by the new building, and the increased facilities afforded, have enabled many new branches of work to be undertaken.

The increased space in the Museum has afforded opportunities for arranging a number of special temporary Exhibitions of appliances, such as—sewage-disposal plant;—apparatus for the medical inspection of school children;—sanatoria and tuberculosis shelters;—and exhibits premiated at the Exhibitions.

The Lectures to Army Officers have been largely developed, at the request of the War Office.

The Colonial Office and other Government and Official Bodies have applied to the Institute for assistance in making sanitary appointments in the Colonies and elsewhere.

Definite Branches of the Institute have been established in South Africa, Western Australia, and New Zealand, and a special Colonial Supplement to the Journal has been issued.

New centres for Examinations have been established in Victoria and New Zealand, and also in India in conjunction with the Government of the Bombay Presidency, and a new Examination has been instituted for Smoke Inspectors.

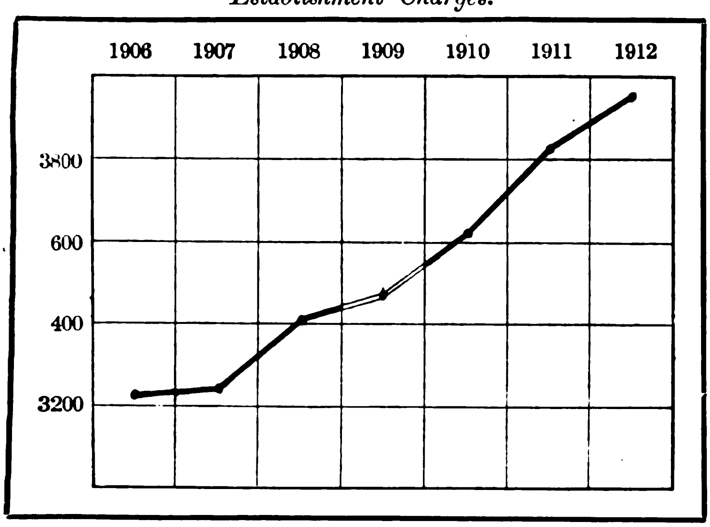
The steady development of all these functions is of vital importance to the Institute, because a large part of its revenue is derived from special branches of work, the income from which depends on the energy devoted in each year; and only the smaller portion of the revenue is derived from subscriptions and other assured sources, which usually form the staple income in other societies.

FINANCIAL.

With regard to the financial aspect of the change, some trepidation was felt as outcome of the increased expenditure that would be involved, and the responsibilities that would be incurred, by taking the new buildings, and it was anticipated that for the first few years the income of the Institute would barely meet the expenditure, or that it might even be necessary to supplement the income by drawing on capital.

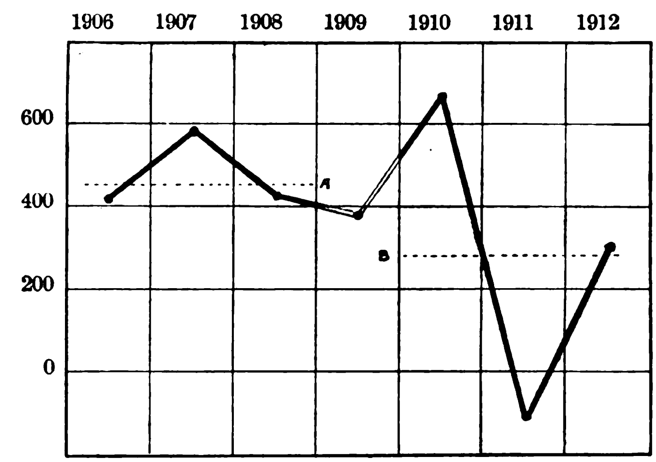
Events, however, have proved the change to have been a direct financial success, for notwithstanding the larger expenditure occasioned by the increase in Establishment charges, the formation of

Establishment Charges.



additional reserve funds, and the cost of new branches of work undertaken, the accounts for the three years in the new building show an average balance of receipts over expenditure of £286 per annum, instead of the anticipated deficit.

Balances of Income and Expenditure.



A—Average 1906–8=£462. B—Average 1910–12=£286.

The result is that since its establishment in these buildings, including the year of transition, the Institute has not only met its largely increased expenditure, but has added to its capital an amount of over one thousand pounds.

It has also paid all the liabilities arising from loss of rent and dilapidations connected with the old building in Margaret Street.

A contributory Thrift and Benefit Scheme has been established for the Staff, which has a reserve balance in hand of £492, and this in a large measure reduces any call that might be made on the funds of the Institute for this purpose.

The Institute has also a large fund reserved as a set-off against the subscription of Life Members.

In addition to these allocated funds, it has an accumulated Reserve Fund amounting altogether to between Seventeen and Eighteen Thousand Pounds, made up partly of fixed assets, consisting of the building, Library, Museum, etc., £15,000, and partly of liquid assets, consisting of cash and current marketable investments amounting to £3,000.

THE ROYAL SANITARY INSTITUTE.

REVIEWS OF BOOKS.

Perfect Health for Women and Children.*

Dr. Chesser's object in writing this book was to provide for women information with regard to the symptomatology of disease and the preservation of health. The book is exceedingly practical, and very pleasantly and simply written. It is divided into three sections: the first showing how to keep healthy, and containing chapters on such subjects as health and open air, physical training, etc.; the second section treats of sick nursing in the home, and gives information with regard to remedies, diet, infectious diseases, the nursing of children and so on; while the third deals with common ailments.

Books such as this, especially when they are well done, are undoubtedly of value, and Dr. Chesser's is well done, and may unhesitatingly be recommended.

C. P.

Experimental Mensuration.†

In an interesting preface, the object of this book is set out to lead the student as far as possible to discover everything for himself by means of simple experiments. Each experiment described in the book should be carried out by the student, and conclusions drawn and verified whenever possible. Afterwards he is shown how his conclusions can be deduced from the results of previous experiments, and he is encouraged to construct chains of deductive reasoning for himself. He thus gains a knowledge of geometry as a whole based on the firm ground of actual experience, and in which every part is connected with every other part. This has been well carried out in the book, and it can be highly recommended for the clear manner in which all the propositions are thus demonstrated. H. D. S.

Lessons on Elementary Hygiene and Sanitation.‡

This is the third edition of a book originally published in 1905, intended to form an elementary text-book for the use of schools in the tropics. It consists of 14 lessons, of which 4 afford elementary instruction in anatomy and physiology, whilst 5 of the lessons are devoted to those diseases particularly common to tropical climates, and contain all the information necessary for an elementary knowledge of tropical diseases. The lessons on malaria are written in simple but clear language, easily understandable, and the book should fulfil the object for which it is written. H. W.

* Perfect Health for Women and Children, by Elizabeth Sloan Chesser, M.B., Ch.B. 276 pp., 8vo. London, 1912. Methuen & Co. Price 3s. 6d.

† Experimental Mensuration, by H. S. Redgrove, B.Sc., F.C.S. 328 pp., 8vo. London, 1912. Wm. Heinemann.

‡ Lessons on Elementary Hygiene and Sanitation, with special reference to the Tropics. By W. F. Prout, C.M.G., M.B., C.M. (Edin.). 184 pp., 8vo. London, 1913. J. and A. Churchill. Price 2s. 6d.

THE HOUSING OF THE WORKING CLASSES ACT, 1890 TO 1909.*

The Memorandum issued on this subject in July, 1911, has undergone some revision, and model plans for suggesting arrangements of rooms and other accommodation are now added. Some of these plans have previously been placed at the disposal of certain local authorities who have sought the Board's assistance, but it has now been decided to make them available generally.

A new Memorandum is thus issued under date 25th March, 1913. Four pages are occupied with general suggestions as to the type of house and site for municipal building at a rental within the scope of the poorer classes, nothing being said as to the desirability of such buildings being self-supporting.

The type advised is the self-contained house; and it is doubtful if an exception of limited accommodation should be specified not only for aged persons without a family, but also for newly-married couples, who may not be easily moved when children are born.

There is a hint at various town-planning principles, such as the limitation of ten houses to the acre, economy in road-making, and the setting back of the frontage line; a future edition might with advantage specify these suggestions less vaguely.

Otherwise the Memorandum will meet with general approval. All the usual points on which sanitary experts insist are given their due attention. The five designs of two-floor cottages appended are open to little criticism, and should be most useful. F. E. F.

STUDIES IN SMALLPOX AND VACCINATION.†

The book contains criticisms based on the cases of smallpox treated in the Liverpool hospitals during the last epidemic of smallpox in 1902–3 and subsequently.

It is divided into three parts, of which the first is concerned with the study of 1,163 cases of smallpox considered in reference to vaccination in modifying the disease. The figures show a diminished case mortality in the unvaccinated, being 2·9 per cent. in the vaccinated and 27·2 per cent. in the unvaccinated, and these figures are important, as they are based on no less than 943 cases occurring in vaccinated persons, as against 220 in unvaccinated persons, the deaths respectively being 28 and 60.

The figures show that in vaccinated persons no deaths occur until after the 20th year of life, and that the majority of these persons have the disease in a mild form; whereas in the unvaccinated the type of disease is severe, and 35 deaths occur in persons under the age of 20, of which no less than 17 were children under 2 years of age.

Part 2 is an analysis of 943 cases of smallpox with primary vaccination, and concerns the relation between the scar area and the severity of the disease. It is shown that in almost every age group, the mildest cases of the disease are those with the largest average scar area, and the figures clearly indicate that the amount of immunity may be estimated by the superficial area of the scar.

---

* The Housing of the Working Classes Acts, 1890 to 1909. Memorandum with respect to the Provision and Arrangement of Houses for the Working Classes. Issued by the Local Government Board. 10 pp., f'cap. London, Wyman & Sons. Price 3d.

† Studies in Smallpox and Vaccination, by William Hanna, M.A., M.D., D.P.H. 52 pp., 4to. Bristol, 1913. John Wright & Sons.

Part 3 deals with the effect of the protective value of vaccination or re-vaccination performed after exposure to infection and the appearance of the rash if the disease occurs, and Dr. Hanna thinks that this is effective the earlier it is done, and that protection is afforded against smallpox by vaccination when performed within three days after infection.

The preface states that the book is intended to appeal to medical officers of health, vaccination officers, and those in charge of infectious disease hospitals, but the facts are so plainly expressed that it might be read by the general public with advantage. H. W.

Hygiene in the Tropics.*

This is a handy yet comprehensive book, traversing practically the whole field of hygiene, well arranged, and with the information conveyed in plain language. The authors do not claim much originality, but have endeavoured to make their book "concise, thoroughly reliable, and up to date." In pointing out some inaccuracies of detail, we must not be supposed to depreciate the work, but to offer hints for a succeeding edition. It is hardly correct to say that spring water is "valuable for medicinal purposes on account of the mineral matters which it usually contains" (p. 5). Under phosphorus poisoning (p. 69) in match making, the use of the harmless red or amorphous phosphorus, which is now becoming general, might have been mentioned. The chapter on diet in India is valuable. The writers agree that a fairly high protein intake is desirable. It is misleading to say (p. 160) that the skin formed on the surface of milk when boiled is called the cream; this term is limited to the layer of fat that rises naturally on standing. The chapter on Removal (printed by mistake Disposal) of Refuse, with the description of forms of closets, is distinctly good; a six-inch drain is, however, too large for an *ordinary* house. The chapter on Disposal of Sewage is inadequate, especially as regards methods suitable for India. We are glad to see that the authors approve of "a good nap" in the middle of the day during the hot weather, but we miss any allusion to the need for protecting the abdomen from chill by a cummerbund; probably it is such a matter of course that the practice is taken for granted as not needing mention. On page 238, in quoting Haughton's formula for work done in walking, the values of the co-efficient of traction should have been given; without this the formula is meaningless. In allusion to the value of vaccination, the experience of Madras is quoted: the mortality from smallpox was 42 per 100,000 for the nineteen years before vaccination was compulsory, and only 6 per 100,000 for the nineteen years subsequent to the introduction of compulsion. The writers might have quoted more recent evidence, such as that of Indian jails, where the smallpox mortality was only 3 per 100,000 in 1910; or that of the Indian Army, where the death-rate from this cause was only *one* per 100,000 in the same year. The chapter on Disease Prevention is, on the whole, excellent. There are several misprints, perhaps unavoidable: Rhinochota (p. 271) for Rhynchota, ærated for aërated (*passim*), "branched" for "branch drain," dumble-shaped for dumb-bell shaped (p. 251), and *Brassica* (for *Sinapis*) *nigra* (p. 179). The book is, on the whole, exceedingly well printed and got up, clearly arranged, and very moderate in price. It contains a very large amount of information, and should be most useful to all concerned with the practice of public health in India. A. M. D.

---

* Hygiene in the Tropics. A Treatise on Hygiene and Public Health, with special reference to the Tropics, by G. N. Ghosh and J. L. Das; with an Introduction by Col. K. Macleod, M.D. 378 pp. Calcutta: Hilton & Co. 1912. Price 5s. net.

MEETINGS HELD.

ORDINARY GENERAL MEETING.—RETIRING PRESIDENT.

At the Ordinary General Meeting on April 23rd, the following resolution was unanimously carried, and a copy was sent to His Grace the Duke of Northumberland:—

Resolved: "That the period for which His Grace the Duke of Northumberland was elected as President of the Institute having terminated, this meeting desires to express to His Grace the most sincere thanks for his cordial sympathy and assistance given to the Institute during his nine years of office, a period in which the Institute has increased its Membership from 3,000 to over 4,000, and its work has been extended to all parts of the British Empire. It is a matter of grateful recollection to the Institute that its foundation in 1876 was under the auspices of the House of Northumberland, and that during the Presidentship of His Grace, the Institute was established in commodious and suitable buildings, well fitted to its rapidly extending work.

"The Members desire to express the hope that they may long have the benefit of His Grace's advice and co-operation if special occasions should arise in the Institute's affairs."

The following letter was received from His Grace:—

26th April, 1913.

DEAR SIR,—I am much obliged to you for your letter of the 24th instant, and for the papers which accompanied it, and which have interested me much.

I shall be obliged if you will take a suitable opportunity of expressing my best thanks to the Members of The Royal Sanitary Institute for the kind resolution they have passed with regard to my Presidency. It has always been a great satisfaction to me to be associated with an Institution which is doing so much valuable work, and I am much indebted to the Members for the kindness which I have always received from them.

May I also take this opportunity of thanking you very cordially for the advice and assistance you have so often given me.

It will always be a pleasure to me to render any service to the Institute in my power.

I am, Dear Sir,
Yours faithfully,
NORTHUMBERLAND.

E. WHITE WALLIS, Esq.

SESSIONAL MEETINGS.

Cheltenham.—The meeting was held in the Town Hall on Friday, May 16th, at 7.30 p.m., when a discussion on "Aids and Hindrances to the present-day effort to Diminish Tuberculosis" was opened by J. H. Garrett, M.D., D.P.H., Medical Officer of Health, Cheltenham, and J. Middleton Martin, M.D., D.P.H., Medical Officer of Health, County of Gloucester. The chair was taken by Louis C. Parkes, M.D., D.P.H.

On Saturday, May 17th, visits were made to the Minor Clinic of the Education Committee; some private Slaughter-houses and the Public

Abattoir; the Ash Destructor and Electric Light Works, etc.; and the members were entertained to luncheon by W. N. Skillicorne, J.P., Chairman of the Public Health Committee.

London.—The meeting was held at the Institute on Tuesday, May 20th, at 7.30 p.m., when an Address on "London's Water Supply" was delivered by E. B. Barnard, J.P., M.A., Chairman of the Metropolitan Water Board. The chair was taken by Sir Alexander Binnie, M.Inst.C.E.

On Wednesday, May 21st, a visit was made to the King George Reservoir, Chingford.

Chester.—The meeting was held in the Town Hall, on Friday, May 30th, at 7.30 p.m., when a discussion on "Modern Methods for the Purification and Softening of Water Supplies" was opened by Joseph Parry, M.Inst.C.E., Chief Engineer, Liverpool Corporation Waterworks. The chair was taken by H. Percy Boulnois, M.Inst.C.E.

On Saturday, May 31st, visits were made to the West Cheshire Water Company's Pumping Station, Hooton, where the Permutit Softening Plant was inspected; to the Chester Waterworks; and the Hydro Electricity Works.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, for Smoke Inspectors, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses have been held at:—

London, May 2nd and 3rd.

For Inspectors of Meat and Other Foods:—

Manchester, April 25th and 26th.
London, May 16th and 17th.

At these Examinations 233 candidates presented themselves, and the following were awarded certificates:—

Sanitary Science as applied to Buildings and Public Works.

Brown, Arthur George Gray.
Denyer, John.
Dyson, John.
Gangulee, Jnanendra Nath.
Grice, John Arthur.
Munns, William.
Phelps, Arthur Cooper.
Restall, Edward Bernard.
Wilcock, Watkin.

School Hygiene, including Elementary Physiology.

Duchesne, Dorothy Muriel.
Gray, Frederick Rowland.
Jones, Marguerite Norma.
Kydd, Muriel Carrie.
Lord, Dorothy Foster.
Marsden, Louisa Mary Weymouth.
Mason, Beatrice Constance Hambury.
McLachlan, Jeanie Ethel.
Robinson, Emily Margaret.
Robinson, Ruth Olive.
Rosselet, A. M.
Smythe, Marjorie José Drew Thompson.
Speirs, Anna Osman.
Symons, Mary Irene.
Turner, Dorothy Burton.
Vaughan-Clark, Phyllis Aubrey.

Women Health Visitors and School Nurses.

ANDERSON, MAY CHRISTINA.
ATHERTON, KATE CROPPER.
BECK, MABEL CONSTANCE.
BURGHES, ELLEN BECK.
CHADWICK, EDITH CAROLINE.
CHAWNER, EMMA CHARLOTTE.
CHISHOLM, DOROTHEA MARY.
CONNOLLY, JULIA.
GOWER, HENRIETTA.
HAYWARD, JESSIE CLEMENTINA.
HOBART, FLORENCE GERALDINE.
KEOGH, BEATRICE MARY.
MONTAGUE, LILIAN ANNE.
MOORE, NORAH MILDRED.
MURRAY, IDA HARGRAVE.
OWEN, ELIZABETH.
PULMAN, ETHEL.
ROSIER, EDITH.
SHARPLESS, RUTH JANE.
SMITH, CONSTANCE WINIFRED.
TAYLOR, BERTHA.
TODHUNTER, HELEN MARY.
WISE, FLORENCE EDITH.

Inspectors of Nuisances.

BALDWIN, LIONEL DOUGLAS.
BARTLETT, WILLIAM GEORGE.
BLANCHARD, LOUIS MATTHEW.
BRANSOM, WINIFRED DAISY.
COUCH, CHARLES JOHN.
FOAKES, WILLIAM WARREN.
GARMAN, ARTHUR STANLEY.
HALL, ETHEL MARY.
HOWELL, LEONARD GEORGE.
HUGHESDON, CONSTANCE.
JACKSON, ETHEL MAUD DOROTHY GRIERSON.
JOHNSON, STANLEY HUGH.
KEEN, RALPH.
MANT, JAMES SIDNEY.
MAYNARD, CHARLES EDWARD.
MCRAE, FREDERICK NEWBERRY.
NICHOLS, FRANK VERNON.
PAYNE, RUBY CATHERINE CAVAH.
PEDDAR, GERTRUDE MAY.
RABBITTS, CLIFFORD JOSIAH.
RICHARDS, RICHARD RUSSELL.
SCHWEITZER, ALBERT HENRY CHURCHMAN.
SHINER, CHRISTINE ALICE.
STRUTT, CHARLES WILLIAM.
SUTTON, MARIE.
TOBITT, CYRIL RICHMOND.
WEBB, JOHN LESLIE.
WREFORD, THOMAS.

Inspectors of Meat and Other Foods.

ASHWORTH, ARNOLD.
AVIS, ROBERT THOMAS.
BARON, GEORGE.
BLENCOWE, EDWARD PROWETT, *Capt., A.S.C.*
BOYD, C. T., *Capt., A.S.C.*
BURRELL, HORACE.
BURTON, COLIN, *Capt., A.S.C.*
COCKSHOTT, ARTHUR MAURICE, *Capt., A.S.C.*
COLLIER, FREDERICK.
DANE, HARRY,
DUTTON, ARTHUR LAMB.
EGNER, GEORGE.
EVANS, JOHN JENKIN.
FLYNN, DENNIS FREDERICK SOMERS.
FRENCH, FRANK EDWIN GEORGE.
GILL, HERBERT WILLIAM.
GRANTHAM, JAMES.
HAMMERSLEY, HAROLD ST. GEORGE, *Lieut., A.S.C.*
HOLDEN, A. H. S., *Capt., A.S.C.*
HOLMES, ROBERT.
HOWARTH, THOMAS BLAND.
JONES, DAVID JAMES.
JONES, MEREDITH.
LLOYD, ARTHUR CARTWRIGHT.
LONGFELLOW, ALEC.
LONGHURST, WILLIAM LEWIS.
MACONOCHIE-WELLWOOD, WILLIAM A. M. G., *Capt., A.S.C.*
MATHER, ROBERT HUGH.
MILES, ALBERT GEORGE JOHN.
MILNE, ALFRED SETON, M.R.C.V.S.

Morris, John Hugh, *Capt., A.S.C.*
Ollett, John Henry T.
Partington, Thomas.
Peterson, G. L., *Capt., A.S.C.*
Pratt, George Henry.
Robinson, Annesley Craven, *Capt., A.S.C.*
Robinson, Thomas.
Robinson, William Pasley, *Capt., A.S.C.*
Shaw, Eli.
Smith, Henry Philips, *Capt.*
Tillock, William.
Tweedie, James Moore, *Lieut., A.S.C.*
Watts, Arthur Augustus.
Wood, Alfred Ernest.
Wood, James.
Wright, H. H., *Capt., A.S.C.*

FORTHCOMING MEETINGS.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors Qualifying for Membership, for Inspectors of Nuisances, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses:—

Leeds, June 6th and 7th.
Birmingham, June 13th and 14th.
Liverpool, June 20th and 21st.
Cardiff, June 27th and 28th.
London, July 25th and 26th.

For Inspectors of Meat and Other Foods:—
Birmingham, July 18th and 19th.

Exeter Congress and Exhibition, 1913.

The meeting will be held at Exeter from July 7th to 12th, under the Presidency of the Right Hon. Earl Fortescue, K.C.B., Lord Lieutenant of Devonshire.

An illustrated article on Exeter was given at page 37 of the April Supplement, and the Preliminary Programme is given at page 94.

Calendar for June and July, 1913.

As far as at present arranged.

JUNE.

6	F.	Examinations—Leeds.
7	S.	
13	F.	Examinations—Birmingham.
14	S.	
20	F.	Examinations—Liverpool.
21	S.	
27	F.	Examinations—Cardiff.
28	S.	

JULY.

7-12.		**Congress and Exhibition,** Exeter. President: The Right Hon. Earl Fortescue, K.C.B. (Lord Lieutenant of Devonshire).
18	F.	Examination for Inspectors of Meat and other Foods—Birmingham.
19	S.	
25	F.	Examinations—London.
26	S.	

LIST OF MEMBERS AND ASSOCIATES

ELECTED MAY, 1913.

MEMBERS.

*** Marked thus have passed the Examination of the Institute in Sanitary Science as applied to Buildings and Public Works.**

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

§ Marked thus have passed the Institute's Examination for Sanitary Surveyors (India).

Reg No.	Date of Election.	
3438	1913. May.	ABRAMS, Herbert John Sinclair, F.I.S.E., *Hutton Mount, Pattison Road, Child's Hill, N.W.*
3450	1913. May.	*AHMED, Syed Mohiuddin, *Sasseram, E.I.R.., India.*
3439	1913. May.	BURNET, Edward, B.A., B.SC., M.B., CH.B., (*M.O.H.*), 17, *Lansdowne Road, Tunbridge Wells.*
3451	1913. May.	*CURRIE, Arthur Lorimer, F.S.I., 192, *Ledard Road, Langside, Glasgow.*
3440	1913. May.	FRASER, Percival Maurice, A.R.I.B.A., 13, *Old Square, Lincoln's Inn, W.C.*
3441	1913. May.	GRAY, Albert Winter, M.INST.MUN.E., *Engineer and Surveyor's Dept., Lambeth Town Hall, Brixton Hill, S.W.*
3452	1913. May.	*GRICE, John Arthur, 35, *Cathcart Road, South Kensington.*
3453	1913. May.	*HALL, Thomas Charles Sydney, 133, *Tufnell Park Road, N.*
3442	1913. May.	‡HINDES, Edward Johnson, *Station Road, Beccles, Suffolk.*
3443	1913. May.	HUTT, Cecil William, M.A., M.D.CANTAB., D.P.H.OXFORD, (*School M.O.*), 26, *Florence Road, Brighton.*
3444	1913. May.	KIRBY, Frederick Oscar, M.SC., ASSOC.M.INST.C.E., *Borough Surveyor and Waterworks Engineer, Mansion House, Doncaster, York.*
3445	1913. May.	§MAMA, Sorab N. Khetwady, *12th Cross Lane, Bombay, India.*
3446	1913. May.	MONTGOMERY, Richard Nathaniel, ASSOC.M.INST.C.E., 11, *St. Mary's Road, Pembroke, Co. Dublin.*
3454	1913. May.	*MUNNS, William, 74, *Bexley Road, North Heath, Belvedere, Kent.*
3447	1913. May.	NATHANIELSZ, Arthur Holman, ASSOC.M.INST.C.E., *District Lymm Bungalow, Anuradapura, Ceylon.*
3455	1913. May.	*PHELPS, Arthur Cooper, 3, *Streatham Place, Streatham Hill, S.W.*
3456	1913. May.	*PLANT, Clifford Ernest, *Chief Engineer's Office, Railway Department, Brisbane, Queensland.*
3460	1913. May.	READ, Mabyn, M.D.CANTAB., M.R.C.S.LOND., D.P.H.CAMB., (*M.O.H.*), *The Guildhall, Worcester.*

3448 1913. May. REYNOLDS, Leethem, B.A., M.B., B.C., D.P.H.CANTAB., CAPT.I.M.S., *Edensor, Ascerton Road, Sidmouth, Devon.*

3457 1913. May. *SWASH, Frank Stanley, A.R.I.B.A., *Montpellier Park, Llandrindod Wells, Radnorshire.*

3458 1913. May. *WILCOCK, Watkin, 70, *Kingswood Road, Gillingham, Kent.*

3259 1913. May. *WILLIAMS, William Howard, *Maes-yr-Hâf, Soberton Avenue, Cardiff.*

3449 1913. May. WRIGHT, William, *Borough Surveyor, Guildhall, Grantham.*

ASSOCIATES.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

V Marked thus have passed the Examination for Women Health Visitors and School Nurses.

S Marked thus have passed the Examination in School Hygiene, including Elementary Physiology.

M Marked thus have passed the Examination of the Institute for Inspectors of Meat and Other Foods.

|| Marked thus have passed the Examination of the Institute for Smoke Inspectors.

Reg. No. Date of Election.

6217 1913. May. ‡ABSON, Herbert, 14, *Gainsborough Road, Bow, E.*

6152 1913. May. V ATHERTON, Miss Kate Cropper, *Wandle Park House, Wimbledon.*

6153 1913. May. M‡AVIS, Robert Thomas, 6, *Shelton Road, Merton Park, S.W.*

6218 1913. May. M‡BARNETT, Fred, *Town Hall, Bilston, Staffs.*

6154 1913. May. ‡BARTLETT, William George, *Borough Surveyor's Office, High Wycombe.*

6155 1913. May. ‡BARTON, Alexander, 24, *West Street, Buxton.*

6156 1913. May. ‡BRANSOM, Miss Winifred Daisy, 53, *Priory Park Road, Kilburn, N.W.*

6157 1913. May. VBREMNER, Miss Isabelle, *Rosevale, Dollar, Clackmannanshire.*

6158 1913. May. ‡BROAD, Arthur Smith, 11, *Madeley Street, Tunstall, Stoke-on-Trent.*

6219 1913. May. S BRUHL, Mrs. Alice, *Triplow, Romford, Essex.*

6159 1913. May. V BURGHES, Miss Ellen Beck, *Highclere Road, Basset, Southampton.*

6160 1913. May. ‡CASSTLES, Thomas, 10, *Lancaster Street, Colne, Lancs.*

6161 1913. May. VCHAWNER, Miss Emma Charlotte, 26, *Church Lane, Hornsey, N.*

6162 1913. May. ‡CHEETHAM, Henry, 2, *Christ Church Street, Preston.*

6163 1913. May. ‡COUCH, Charles John, 1, *Woodland Terrace, Old Charlton, Kent.*

6164 1913. May. ‡CURTIS, Alfred Frederick, *Health Department, Town Hall, Melbourne, Victoria, Australia.*

6165 1913. May. V DAVIDSON, Miss Elizabeth, *Church Road, Uppermill, nr. Oldham.*

6166 1913. May. ‡DAVIES, Frederick William, P.A.S.I., *High Street, Thornbury, Glos.*

Reg. No.	Date of Election.	
6167	1913. May.	‡DAVIS, William Henry, *Bagshaw Farm, Pennington Green, Hindley, nr. Wigan.*
6168	1913. May.	*s*ELLIS, Miss Miriam Maude, *Annesley House, Tamworth, Staffs.*
6169	1913. May.	‡ELLISON, James, 99, *Wellfield Road, Preston.*
6170	1913. May.	‡FOAKES, William Warren, 109, *Carlyle Road, Manor Park, E.*
6171	1913. May.	‡FORMAN, Frederick Gerald, *Chellaston, nr. Derby.*
6172	1913. May.	*v*GOWER, Miss Henrietta, *Clematis Cottage, Saltwood, Hythe.*
6173	1913. May.	‡GRAHAM, William George, 55, *Long Street, Germiston, Transvaal.*
6174	1913. May.	*v*GRANT, Miss May, 187, *City Road, Cardiff.*
6175	1913. May.	*M*GRANTHAM, James, 3, *Shaw Road, Heaton Moor, Stockport.*
6220	1913. May.	‡GRAY, John William, *Silver Hill, Pateley Bridge, Yorks.*
6221	1913. May.	*v*HALL, Miss Lily Beatrice Maud, *Martley Infirmary, Worcestershire.*
6176	1913. May.	*v*GUBBIN, Miss May Brendon, 15, *Redland Grove, Bristol.*
6177	1913. May.	‡HALL, Cyril A., 93, *Beattie Street, Balmain, New South Wales.*
6178	1913. May,	‡HALL, Miss Ursula Alice, *Bounder House, Belsay, Northumberland.*
6179	1913. May.	‖HAMILTON, Harry, 431, *Eccles New Road, Weaste, Salford.*
6180	1913. May.	‡HOBAN, Richard, *The Sanitary Department, City Chambers, Edinburgh.*
6181	1913. May.	*M*‡HOLMES, Robert, 370, *Kirkstall Road, Leeds.*
6182	1913. May.	*s*HUGHES, Walter William Trevor, 24, *King Street, Darlaston, Staffs.*
6183	1913. May.	*v*JENKINS, Miss Elizabeth Gertrude, *Brynawel, Vicarage Road, Pen-y-graig, Glam.*
6184	1913. May.	*v*JONES, Miss Letitia Jane, 94, *Wood Road, Pontypridd, Glam.*
6185	1913. May.	‡KEEN, Ralph, 14, *Myrtle Gardens, Hanwell, W.*
6186	1913. May.	‡KENYON, John, 8, *Wick Street, Verulam, Natal, S. Africa.*
6187	1913. May.	‡KILLIP, Joseph, 11, *Western Drive, Grassendale, Liverpool.*
6188	1913. May.	‡McRAE, Frederick Newbury, *Borough Surveyor's Office, Saffron Walden, Essex.*
6189	1913. May,	‡MANT, James Sidney, *Victoria Road, Emsworth, Southampton.*
6222	1913. May.	‡MANT, William, "*Ferndale,*" *Victoria Road, Emsworth, Southampton.*
6190	1913. May.	‡MARAIS, Johannes Nicholas, *Sanitary Inspector, Malmesbury, Cape Province.*
6191	1913. May.	‡MULES, John F., 19, *Queen Street, Pembroke Dock.*

Reg. No. Date of Election.

6192 1913. May. ✓MURRAY, Miss Ida Hargrave, 53, *Croxted Road, Dulwich, S.E.*
6193 1913. May. ✓NICHOL, Miss Margaret Mitchell, *Bradford House, Ashton New Road, Manchester.*
6194 1913. May. ‡NICHOLS, Frank Vernon, 79, *Grafton Road, Acton, W.*
6195 1913. May. ‡OAKES, Jesse, "*Kirkdale,*" *Shepshed, Leicestershire.*
6196 1913. May. ‡PEDDAR, Miss Gertrude May, 5, *Elm Road, Beckenham.*
6197 1913. May. ‡PRIDEAUX, Byron Thomas, *c/o Municipal Health Department, Shanghai, China.*
6198 1913. May. ✓PULMAN, Miss Ethel, 19, *Dorset Street, Marylebone, W.*
6199 1913. May. ‡RABBITTS, Clifford Josiah, 18, *Gomer Place, Teddington.*
6200 1913. May. ‡RAINE, Leonard, *Surveyor and Inspector, Christchurch R.D.C., Hants.*
6201 1913. May. ‡REES, Joseph Lewis, *Crongar House, Llandaff North, Cardiff.*
6202 1913. May. ‡RICCOMINI, James Arthur, 12, *Newton Road, Faversham, Kent.*
6223 1913. May. ‡RICE, E. T., 10, *Somerset Place, Swansea, Glam.*
6203 1913. May. ‡ROBINSON, Walter Richard, "*Westwood,*" *Loftus S.O., Yorks.*
6204 1913. May. ✓SHAW, Miss Gertrude Power, 38, *Headingley Mount, Headingley, Leeds.*
6205 1913. May. ‡SILVERWOOD, Frank Harris, 174, *Downham Street, Blackburn.*
6206 1913. May. ‡SIMMONS, Albert William, 5, *Sunningdale, Clifton, Bristol.*
6207 1913. May. ‡SMITH, James, *Sanitary Overseer, Johannesburg, Transvaal.*
6208 1913. May. ‡STRUTT, Charles William, 1, *The Park, Ealing, W.*
6209 1913. May. ‡TAIT, Henry Makins, *P.O. Box 542, Kimberley, S. Africa.*
6210 1913. May. ‡TOBITT, Cyril R., "*Woodlands,*" *Cairsboro Avenue, Caversham.*
6211 1913. May. ‡THOMAS, Ivor, 11, *Ystrad Terrace, Gelli, Pentre, Glam.*
6212 1913. May. *s*TURNER, Miss Norah Elizabeth, "*Brooklands,*" *Herbert Road, Bournemouth West.*
6213 1913. May. ‡WEEKS, Herbert John, *Bank House, Fore Street, Buckfastleigh, Devon.*
6214 1913. May, ‡WHITFORD, Hamilton, *Council Chambers, Temora, New South Wales; and 35, Georgina Street, Newtown, Sydney, New South Wales.*
6215 1913. May. ‡WILLIAMS, Frank Arton, 107, *London Road, Hazel Grove, Ches.*
6216 1913. May. ‡WOOD, W., 1, *St. Paul's Street, New North Road, Islington.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY.

APRIL AND MAY, 1913.

*** *For publications of Societies and Institutions, etc., see under "Academies."*

ACADEMIES (BRITISH).

London. *Borough of St. Marylebone Health Society*, 1912. 24 pp., 8vo. London, 1913. *The Society.*

——— *Institution of Civil Engineers.* Minutes and Proceedings, Vol. CXCI. 438 pp., 8vo. London, 1913. *The Institution.*

——— *School Dentists' Society.* Its Objects and Aims (Second Edition). 114 pp., 8vo. Watford, 1913. *The Society.*

ACADEMIES (FOREIGN).

America. *Rockefeller Sanitary Commission for the Eradication of Hookworm Disease.* Third Annual Report. 130 pp., 8vo. Washington, 1912. *The Commission.*

——— *Smithsonian Institution.* Annual Report of the Board, 1911. 688 pp., 8vo. Washington, 1912. *The Institution.*

Bengal. *Sanitary Commissioner.* Three brief Notes on Laboratory Methods. Research into the effect of storage of highly-polluted waters in the monsoon season. An investigation of the properties of Calcutta sewage. Report on the municipal water supplies in Bengal for 1911 and 1912. F'cap. Calcutta, 1912. *Major W. W. Clemesha, M.D., D.P.H.*

Chalmers, *A. K., M.D., D.P.H.* Ophthalmia neonatorum: Memorandum by Medical Officer of Health, submitting Report by Dr. Florence Mann. 12 pp., f'cap. Glasgow, 1913. *The Author.*

MEDICAL OFFICERS OF HEALTH AND OTHER SANITARY REPORTS.

Aberdeen, City of, December, 1912, January and February, 1913 .. *Matthew Hay, M.D.*

Australia, Department of Public Instruction, 1911 .. .. .. *J. W. Turner (Superintendent).*

Barnes U.D.C., 1912 .. .. .. *B. C. Stevens, M.D., D.P.H.*

Berwick County, 31st July, 1912 (School Medical Officer) .. .. *Andrew A. McWhan, M.B., D.P.H.*

Bradford and District, Anthrax Investigation Board, 31st October, 1912 *The Board.*

Burnley R.D.C., 1912.. .. .. *H. J. Robinson, M.R.C.S.*

Cardiff, 1912 .. .. *Edward Walford, M.D., D.P.H.*

Cornwall C.C., January, February and March, 1913 .. .. .. *Robert Burnet, M.B., D.P.H.*

Droylesden U.D.C., 1912 .. .. *F. Schofield, Inspector of Nuisances.*

Durham, 1911 .. .. *T. Eustace Hill, M.B., B.Sc.*

Eastbourne, 1909–1911, Meteorological Report .. .. .. *S. R. Henderson.*

Exeter (School Medical Officer) 1912.. *P. H. Stirk, M.R.C.S., L.R.C.P., D.P.H.*

Failsworth U.D.C., 1912 .. .. *George Taylor, M.B.*
Georgetown (Demerara), 1912 (Town Superintendent) .. .. .. *Wm. F. Laurie Thomas, M.Inst.Mun.E.*
Great Yarmouth (School Medical Officer), 1912 .. .. .. *A. N. Stevens.*
Hastings (School Medical Officer), 1912 .. .. .. *O. Polhill Turner, M.R.C.S., D.P.H.*
Herefordshire Districts, 1912 .. *Herbert Jones, D.P.H.*
Higham Ferrers and Rushden, Water Board, 1912 .. .. .. *W. B. Madin, Engineer.*
Huddersfield, 4th Quarter, 1912 .. *S. G. Moore, M.D., D.P.H.*
Huntingdonshire C.C., 1911 .. .. *C. B. Moss-Blundell, M.D., D.P.H.*
Isle of Wight, 1912 .. .. .. *J. Albert Gibson, M.D., D.P.H.*
Johannesburg, 30th June, 1912 (Town Engineer) .. .. *G. S. Burt Andrews, M.Inst.C.E.*
Kidderminster, 1912 .. .. .. *W. H. Moore, M.R.C.S., L.R.C.P.*
Lancaster, 1912 .. .. .. *J. Cates, M.D., D.P.H.*
London, City of, 17th November, 1912, to 15th February, 1913 .. .. *W. Collingridge, M.D., D.P.H.*
Maidstone, 1912 (Chief Sanitary Inspector) .. .. *Wm. Jackling.*
Mutford & Lothingland R.D.C., 1912 *Lawrence Gibson, M.B., D.P.H.*
New Westminster (B.C.), 1912 (City Engineer) .. .. *J. W. B. Blackman, M.Can.Soc.C.E.*
Newport (Mon.), 1912 .. .. *J. Howard Jones, M.D., D.Sc.*
Oulton Broad U.D.C., 1912 .. .. *Lawrence Gibson, M.D., D.P.H.*
Paignton U.D.C., 1912 .. .. *J. Crathorn (Sanitary Inspector).*
Panteg U.D.C., 1912 .. .. .. *J. O'Keeffe, L.R.C.P.*
Penge U.D.C., 1912 .. .. .. *Robert Wilkinson, M.D.*
Rochdale C.B., Quarter ending 31st March, 1913 .. .. .. *A. G. Anderson, M.D., D.Sc.*
St. Austell R.D.C., 1912 .. .. *A. T. Nankivell, M.D., D.P.H.*
Salford C.B., First Quarter, 1913 .. *C. H. Tattersall, L.R.C.P., M.R.C.S.*
Sheffield, 1911.. .. .. .. *H. Scurfield, M.D., C.M.*
Southall-Norwood U.D.C. (Dust Collection) .. .. *Reginald Brown, M.Inst.C.E.*
Southgate U.D.C., 1912 .. .. *A. S. Ransome, M.B., D.P.H.*
Southport, 1912 (School Med. Officer) *G. C. Barnes, M.B., D.P.H.*

Mersey and Irwell Watershed. Proceedings of the Joint Committee for 1912–1913. 264 pp., 8vo. Preston, 1913. *Hugh Stowell, Assoc.M.Inst.C.E.*

Minett, *E. P., M.D., D.P.H.* Diagnosis of Bacteria and Blood Parasites. 80 pp., 8vo. London, 1913. *Baillière, Tindall, & Cox (publishers).*

New York. *Department of Education.* Fourteenth Annual Report of the City Superintendent of Schools, 1911–12. 40 pp., 8vo. New York, 1912. *Wm. H. Maxwell (City Superintendent).*

Registrar-General. *England and Wales.* Index to the Population Tables for England and Wales in Vols. I.–IV. of the Census Report, 1911. Vol. V. Price 3s. 380 pp., f'cap. London, 1913. *Bernard Mallett.*

Social Welfare Association for London. Third Annual Report, 1912. 28 pp., 8vo. London, 1913. *The Association.*

THE

TWENTY-EIGHTH CONGRESS,

1913,

WILL BE HELD AT

EXETER,

From JULY 7th to 12th.

PRELIMINARY PROGRAMME

OF THE

GENERAL ARRANGEMENTS.

ADDRESSES AND LECTURES.

President's Inaugural Address.

Lecture to the Congress.

Popular Lecture.

SECTIONS.

A.—Sanitary Science and Preventive Medicine.

B.—Engineering and Architecture.

C.—Domestic Hygiene.

D.—Hygiene of Infancy and Child-Study.

CONFERENCES.

I.—Municipal Representatives.

II.—Medical Officers of Health.

III.—Engineers and Surveyors to County and Sanitary Authorities.

IV.—Veterinary Inspectors.

V.—Sanitary Inspectors.

EXHIBITION.

An Exhibition of Apparatus and Appliances relating to Health and of Domestic use will be held in connection with the Congress.

PAPERS AND DISCUSSIONS.

The Council invite Papers on subjects relating to Health and Sanitary Science. Papers are limited to about 3,000 words. Accepted papers are, as far as possible, printed and distributed in the Reception Room before they are discussed, and at the Meeting they are taken as read. Authors are allowed five minutes to introduce the main arguments of the paper before the discussion begins. A short abstract must accompany every Paper, both for the convenience of the Press at the Congress and for insertion, subject to the approval of the Council, in the Journal of the Institute, should it not be deemed desirable to publish the paper *in extenso*. No previously published Paper can be accepted. The acceptance of Papers, and the days on which they are to be discussed, are determined by the Council before the beginning of the Meeting, and published in the Daily Programmes, obtainable in the Reception Room. The Council reserve the right of refusing any Papers sent in; and in the case of those accepted, the discussion of them must depend on the time at the disposal of the Meeting. Papers accepted for the Congress cannot be published by the Authors, except by permission of the Council. The Council reserve to themselves the privilege of printing any Paper, either wholly or in part, or of refraining from the publication thereof, if they see fit.

Authors should forward their manuscript by post *as early as possible, and in any case not later than June 7th*, addressed to the Secretary, Royal Sanitary Institute, 90 Buckingham Palace Road, London, S.W.

RESOLUTIONS.

Resolutions put from the Chair at the Meetings must only be in the form of recommendations to the Council of the Institute, by whom all such recommendations will be carefully considered. The number of persons present, and the proportions voting, must be recorded by the Chairman for the information of the Council.

No Resolution can be proposed at any of the Sections or Conferences, unless *sent to the Secretary of the Section or Conference in time for approval and insertion in the Programme for the day on which it is to be proposed.*

No Resolutions can be put to a Meeting unless, in the opinion of the President (or Chairman for the time being), the Section is adequately represented.

RECEPTION ROOM AND PLACES OF MEETING.

A Reception Room will be opened at UNIVERSITY COLLEGE on SATURDAY, JULY 5TH, at 10 A.M., and on the following days at 9 A.M. till 4 P.M., for the issue of all Tickets in connection with the Congress. The Reception Room will be available for Reading, Writing, and Conversation.

The Inaugural Address of the President, the Lecture to the Congress, and the Popular Lecture will be given in BARNFIELD HALL.

The Sectional Meetings, General Meetings, and Conferences will be held in the UNIVERSITY COLLEGE.

The Exhibition will be held in VICTORIA HALL, EXETER.

HOTEL AND LODGING ACCOMMODATION, AND TRAVELLING ARRANGEMENTS

Will be determined by the Local Committee, and information relating to the same may be obtained from the Local Secretaries, and from the Secretary of the Institute.

TICKETS.

Fellows, Members, and Associates of the Institute are supplied with Tickets for the Congress on application to the Secretary before the Congress, or may be obtained at the Reception Room during the Meeting.

To those not connected with the Institute, Congress Tickets will be issued, entitling the holder to the use of the Reception Room, to admission to the Presidential and other Addresses, to all Meetings, to the Exhibition of the Institute, to any Conversazione given by the Institute, and copies of the Monthly Journal of the Institute containing the proceedings of the Congress. The price of the Congress Tickets is £1 1s. each. Ladies' Tickets (not including copies of the Proceedings), 7s. 6d. each. These Tickets may be obtained up to Friday, July 4th, at the Offices of THE INSTITUTE, 90, Buckingham Palace Road, S.W., or at the Offices of the Local Secretaries at Exeter, and on July 5th and following days between 9 a.m. and 4 p.m. in the Reception Room in the UNIVERSITY COLLEGE.

CONGRESS BADGES

Will be issued to Members and Delegates at a charge of 1s. 6d. each. (Exeter Bars only, 6d. each).

EXCURSIONS.

Particulars of these will be published in the local Programme, and Tickets and List of Places to be visited can be obtained at the Reception Room during the Meeting.

RAILWAY ARRANGEMENTS.

The Railway Companies have decided to issue return Tickets to Exeter at a single fare and a third, available from July 1st to 16th. Certificates necessary to obtain this reduction will be supplied with Congress Tickets.

During the meeting, return tickets at a single fare and a third for the double journey (available for two days) will be issued to Members and Delegates for residential purposes, on production of their Congress Tickets, from Exeter to stations not more than 50 miles distant (minimum charge 1s.)

Officers of the Congress.

President.

THE RIGHT HON. EARL FORTESCUE, K.C.B. (Lord Lieutenant of Devonshire).

Vice-Presidents.

THE RIGHT WORSHIPFUL THE MAYOR OF EXETER.
THE WORSHIPFUL THE MAYOR OF PLYMOUTH.
THE HIGH SHERIFF OF DEVON.
THE SHERIFF OF EXETER.
THE RIGHT HON. THE EARL OF IDDESLEIGH.
THE RIGHT HON. VISCOUNT ST. CYRES.
THE RIGHT REVD. THE LORD BISHOP OF EXETER.
THE RIGHT HON. LORD CLINTON, D.L., J.P.
THE RIGHT HON. LORD CLIFFORD OF CHUDLEIGH, D.L.
THE RIGHT HON. LORD POLTIMORE.
THE RIGHT HON. LORD ST. LEVAN, C.B., D.L., J.P.
SIR JOHN SHELLEY, Bart., D.L., J.P.
SIR E. CHANING WILLS, Bart.
SIR THOMAS H. HEPBURN, J.P.
SIR WILFRID PEEK, Bart.
MAJOR-GENERAL C. G. DONALD, C.B.
H. E. DUKE, K.C., M.P.

Hon. Local Treasurers.

A. H. GIBBS.
SIR ROBERT L. NEWMAN, Bart., D.L., J.P.

Chairman of Local Committee.

THE RIGHT WORSHIPFUL THE MAYOR OF EXETER.

Hon. Local Secretaries.

GEO. ADKINS, M.R.C.S., D.P.H., County Medical Officer of Health, Devonshire.
H. LLOYD PARRY, Town Clerk, Exeter.
P. H. STIRK. M.R.C.S., D.P.H., School Medical Officer, Exeter.

Local Offices.—8, SOUTHERNHAY WEST, EXETER.

Local General Committee.

The Right Worshipful the Mayor of Exeter (H. W. Michelmore, Esq.), *Chairman.*

ACLAND, Sir C. T. D., Bart., D.L., J.P.
ALLINGHAM, H. R., M.R.C.S., L.R.C.P., Medical Officer of Health, Totnes.
ANDREW, Mrs. HENRY.
ANDREW, S.
ASH, T. LINNINGTON, L.R.C.P., M.R.C.S., J.P.
BAILEY, F., Clerk to Devon County Council.
BARNSTAPLE, The Worshipful the Mayor of.
BERE, Miss A. G.
BERNARD, A. F., J.P.
BIDEFORD, The Worshipful the Mayor of.
BLACK, L. P., M.B., D.P.H., Medical Officer of Health, St. Thomas.
BLIGHT, W. W., J.P.
BONHAM, A. E., Sanitary Inspector, Exeter.
BRADFORD, Councillor J., M.B.
BRASH, E. A., M.R.C.S., Medical Officer of Health, Exeter.
BUCKINGHAM, The Rev. Preby. F. F., J.P.
BUDD, A., M.B., B.S., Medical Officer of Health, Launceston.
BULLER, A. TREMAYNE, J.P.
BULLER, Miss G.
BURGESS, R., B.A., M.B., M.R.C.S., L.R.C.P., Medical Officer of Health, Tiverton.
CAMPION, Alderman H., J.P.
CHALLICE, Councillor R. M.
CLAPP, G. T., M.B., M.R.C.S., Assistant Medical Officer of Health, Exeter.
CLAY, R. H., M.D., M.R.C.P., M.R.C.S.
CLAYDEN, A. W., M.A.
CLAYDEN, Mrs. A. W.
COLE, Alderman C.
COOMBE, RUSSELL, M.A., F.R.C.S.
COURT, E. D.
COURTENAY, Lady CAROLINE.
DANIEL, T. C., D.L., J.P.
DARTMOUTH, The Worshipful the Mayor of.
DAVIS, J. S. C., J.P.
DAVY, H., M.D., F.R.C.P.
DAW, J. E.
DEPREE, Alderman F. TEMPLER, J.P.
DEVON, The High Sheriff of.
DEVONPORT, The Worshipful the Mayor of.
DOMVILLE, E. J., L.R.C.P., M.R.C.S., J.P.
DUKE, H. E., K.C., M.P.
DUNLOP, T., M.B., C.M., D.P.H., Medical Officer of Health, Torquay.
DYMOND, A. H.
ELSTON, H., J.P.
EVERY, Mrs.
EXETER, The Venerable the Archdeacon of.
EXETER, The Sheriff of.
FERRERS-HOWELL, Mrs. A. G.
FOX, F. E., B.A., J.P.
GANDY, The Rev. MONSIGNOR.
GEARE, Miss EDITH E.
GOODING, M. R., L.R.C.P., M.R.C.S., Medical Officer of Health, Bideford.
GOULD, J., J.P.
GRATWICKE, F. St. GEO.
GRIFFIN, W. H., J.P.
HALL, O., D.P.H., LL.D., B.L., Medical Officer of Health, Devonport.
HAM, W. J.
HARDWICK, W. H.
HARRIS, J. H., M.D., M.R.C.S., L.S.A., D.P.H., Medical Officer of Health, Dartmouth.
HAWKINS, The Rev. E. J.
HEBERDEN, W. B., C.B., J.P.
HEPBURN, Sir T. H., Kt., J.P.
HEYWOOD, A. J.
HIERN, W. P., M.A., J.P.
HOLLEY, Maj.-General, J.P.
HOLMES, R. P.
HUTCHINGS, Councillor A. M.
HUTTON, S.
JERMAN, JAS., F.R.I.B.A.
JONAS, H. C., M.D., M.B., B.S., M.R.C.S., L.R.C.P., Medical Officer of Health, Barnstaple.
JONES, B.
KELLAND, Councillor P., J.P.
KING, W. KENDALL.
KING, Mrs. W. KENDALL.
KITSON, R. P.
LAUNCESTON, The Worshipful the Mayor of
LEY, J. H. F., D.L., J.P.
LORAM, A. T., J.P.
LORAM, Mrs. A. T.
LORAM, Councillor J. A., J.P.
LUCAS, Councillor J. A., F.S.I., A.R.I.B.A.
LYME REGIS, The Worshipful the Mayor of
MACKENZIE, LEWIS, F.R.C.S.
MAPLETON, H. B., M.D., D.P.H., Medical Officer of Health, Newton Abbot.
MARKER, R., D.L., J.P.
MAUNDER, F., J.P.
METHERELL, J. M.
MICHELMORE, Mrs. H. W. (Mayoress of Exeter).
MONTGOMERY, Miss J. D.
MOORE-STEVENS, Col. R. A., J.P.
MORLEY, The Right Hon. the Earl of, J.P.
MORTIMER, Mrs. J.
MOULDING, T., M.INST.C.E., City Surveyor Exeter.
MUNRO, Councillor H. J., J.P.
MURRIN, A. J., J.P.
NECK, J. S., J.P.
NELDER, W. B., F.R.C.V.S.
NETHERCOTT, J. R., J.P. (Chairman Heavitree U.D.C.)
NICHOLLS, E. E., M.B., Medical Officer of Health, South Molton.
NORTHCOTE, Lady ROSALIND.
OKEHAMPTON, The Worshipful the Mayor of.
OWEN, J. G., J.P.
OWEN, Mrs. J. G.
PAIN, R. TUCKER, J.P.
PARSONS, S. G.
PEILE, W. H., M.D., D.P.H., Medical Officer of Health, Sidmouth.
PERRY, EDWIN C., J.P.
PETERS, Alderman J.
PICKARD, RANSOM, F.R.C.S.
PITMAN, The Rev. W. D., M.A., J.P.
PLYMOUTH, The Worshipful the Mayor of.
PRING, Mrs. W. J.
PRING, Alderman T. C.
PRING, Mrs. T. C.
PRYKE, The Rev. Canon.
RICHARDS, A. E.
ROACH, W., F.R.C.V.S.
ROBERTS, C. T. K.
ROBERTSON, Mrs. ELEANOR.
ROPER, A. C., F.R.C.S.EDIN.
ROSS, Alderman C. J.
ROWE, Councillor T. B.
ROWLEY, F. R., F.R.M.S.
SATOW, The Rt. Hon. Sir E. M., P.C., G.C.M.G., J.P.

Local General Committee—continued.

SHELLEY, Sir JOHN, Bart., D.L., J.P.
SILLIFANT, A. O., D.L., J.P.
SLADE-KING, E. J., M.D., L.R.C.P., M.R.C.S., D.P.H., R.C.P.
SNOW, SEBASTIAN C.
SOLLY, R. V., M.D., F.R.C.S., M.R.C.P.
SOPER, H. TAPLEY, F.R.HIST.S.
SOUTH MOLTON, The Worshipful the Mayor of.
SPEAR, Sir J. W., Kt., M.P., J.P.
SPURR, J., B.A., M.R.C.S., L.S.A., Medical Officer of Health, Lyme Regis.
STEELE-PERKINS, Councillor J. S. SHIRLEY, M.B.
ST. MAUR, H., D.L., J.P.
STOCKER, Alderman J., J.P.
STRODE, G. S. S., D.L., J.P.
TANNER, PERCY E.
THOMAS, J. RAGLAN, M.D., D.P.H.
THORNYCROFT, C. E., J.P.
TIVERTON, The Worshipful the Mayor of.
TOWNSEND, Miss EDITH A.
TORQUAY, The Worshipful the Mayor of.
TOTNES, The Worshipful the Mayor of.
TOWILL, Councillor F. G.
TROYTE, H. ACLAND, J.P.
VALLANCE, G. F.
VARWELL, Alderman H. B., J.P.
VICARY, W., J.P.
VICKERY, Councillor W. S.
VLIELAND, Alderman C. J., M.D., J.P.
VLIELAND, Mrs. C. J.
WALCOTT, Col. E. S., C.B., D.L., J.P.
WALE, BERNARD N., B.SC.
WALLOP, The Hon. JOHN, J.P.
WARD, S., J.P.
WEBB, E. H.
WERE, T. KENNET, J.P.
WIDGERY, Alderman F. J., J.P.
WILLIAMS, F. M., L.R.C.P., D.P.H., Medical Officer of Health, Plymouth.
WILLS, Sir E. CHANING, Bart.
WILTON, T.
WOODBRIDGE, A. K.
WRENFORD, R. B.
YOUNG, J. F., M.A., Secretary, Devon County Education Committee.
YOUNG, G.
YOUNG, E. H., M.D., D.P.H., Medical Officer of Health, Okehampton.

Executive Committee.

THE RIGHT WORSHIPFUL THE MAYOR OF EXETER (H. W. Michelmore, Esq.) *Chairman*

A. TREMAYNE BULLER, Esq., *Vice-Chairman.*

ANDREW, S.
CAMPION, Alderman H., J.P.
CHALLICE, Councillor, R.M.
CLAYDEN, A. W., M.A.
COOMBE, RUSSELL, M.A., F.R.C.S.
COURT, E. D.
DAVY, H., M.D., F.R.C.P.
DEPREE, Alderman F. TEMPLER, J.P.
EXETER, THE MAYORESS OF.
EXETER, THE SHERIFF OF.
EVERY, Mrs.
GANDY, Rev. MONSIGNOR.
GOULD, J., J.P.
GRATWICKE, F. St. GEORGE.
HARRIS, J. H., M.D.
HAWKINS, Rev. E. J.
HEBERDEN, W. B., C.B., J.P.
HEPBURN, Sir T. H., J.P.
LORAM, A. T., J.P.
LORAM, Councillor J. A., J.P.
LUCAS, Councillor J. A., F.S.I., A.R.I.B.A.
MUNRO, Councillor, H. J., J.P.
OWEN, J. G., J.P.
PAIN, R. TUCKER, J.P.
PICKARD, RANSOM, F.R.C.S.
PRING, Alderman T. C.
PRING, Mrs. T. C.
PRYKE, Rev. Canon.
ROBERTS, C. T. K.
ROBERTSON, Mrs. Eleanor.
ROPER, A. C., F.R.C.S.EDIN.
ROSS, Alderman C. J.
ROWE, Councillor T. BRADLEY.
STEELE-PERKINS, Counc. J. SHIRLEY, M.B.
STOCKER, Alderman J., J.P.
TANNER, PERCY E.
THORNYCROFT, C. E., J.P.
VARWELL, Alderman H. B., J.P.
VLIELAND, Alderman C. J., M.D., J.P.
WALE, BERNARD N., B.SC.
WARD, S., J.P.
WIDGERY, Alderman F. J., J.P.
WILLS, Sir E. CHANING, Bart.

All Chairmen and Secretaries of Sub-Committees.

Hospitality and Reception Sub-Committee.

THE SHERIFF OF EXETER (R. Every, Esq.), *Chairman.*

ALDERMAN H. CAMPION, J.P., *Vice-Chairman.*

THE MAYORESS OF EXETER.
ANDREW, Mrs. HENRY.
BERE, Miss A. G.
CLAYDEN, Mrs. A. W.
EVERY, Mrs.
EXETER, The Venerable the Archdeacon of.
FERRERS-HOWELL, Mrs. A. G.
GEARE, Miss Edith E.
KING, Mrs. Kendall.
MOULDING, T., M.INST.C.E.
OWEN, Mrs. J. G.
PRING, Mrs T. C.
PRING, Mrs. W. J.
ROBERTS, Mrs. C. T. K.
ROBERTSON, Mrs. Eleanor.
ROSS, Alderman C. J.
ROWLEY, F. R., F.R.M.S.
TOWNSEND, Miss EDITH A.
VLIELAND, Mrs. C. J.
WILLEY, Mrs. H. A.
ANDREW, SIDNEY (Secretary).

Finance Sub-Committee.

SIR T. H. HEPBURN, KT., J.P., *Chairman.*

EXETER, THE SHERIFF OF.
CAMPION, Alderman H., J.P.
MUNRO, Councillor H. J., J.P.
STOCKER, Alderman J., J.P.
VARWELL, Alderman H. B., J.P.
TANNER, PERCY E. (Secretary).

And the Chairmen and Secretary of every Sub-Committee.

Excursions Sub-Committee.

G. F. VALLANCE, Esq., *Chairman.*

ANDREW, S.
JERMAN, J., F.R.I.B.A.
TOWNSEND, Councillor W.
VALLANCE, G. F.
ROSS, Alderman C. J. (Secretary).

Literary and Press Sub-Committee.

J. G. OWEN, Esq. (Editor, *Express and Echo*), *Chairman.*

GRATWICKE, F. ST. GEORGE, (Editor *Devon and Exeter Gazette*).
RICHARDS, A. E. (Editor, *Exeter Flying Post*).
VALLANCE, G. F.
YOUNG, J. F., M.A.
SOPER, H. TAPLEY, F.R.HIST.S. (Secretary)

The Governments, County Councils, Corporations, Local Authorities, Societies, and Universities, who have up to the present appointed Delegates to the Congress.

Colonial Governments (3).

Queensland. New South Wales. Victoria.

Government Departments (4).

Army Council.
Admiralty.
H. M. Office of Works.
War Office.

County Councils (15).

Durham.
East Sussex.
Hertfordshire.
Gloucestershire.
Kildare.
Kesteven.
Lanark.
Lanark (Middle Ward).
Lanark (Upper Ward).
Monmouthshire.
Pembrokeshire.
Salop.
Staffordshire.
Warwickshire.
West Suffolk.

County Boroughs (37).

Barrow-in-Furness.
Birkenhead.
Birmingham.
Blackburn.
Bournemouth.
Bradford.
Brighton.
Bury.
Cardiff.
Coventry.
Dublin.
Exeter.
Gateshead.
Gloucester.
Great Yarmouth.
Halifax.
Hastings.
Ipswich.
Liverpool.
Middlesbrough.
Newcastle-upon-Tyne.
Newport, Mon.
Nottingham.
Plymouth.
Rotherham.
Salford.
Southampton.
Stoke-on-Trent.
Sunderland.
Swansea.
Warrington.
West Bromwich.
West Ham.
West Hartlepool.
Wolverhampton.
Worcester.
York.

Metropolitan Boroughs (7).

City of London.
Finsbury.
Holborn.
Shoreditch.
Stoke Newington.
St. Marylebone.
St. Pancras.

Boroughs, Urban District Councils or Sanitary Authorities (67).

Aberavon.
Alton.
Bangor.
Barnes.
Barnoldswick.
Batley.
Beckenham
Bideford.
Blackrock.
Bodmin.
Carnarvon.
Chard.
Chatham.
Cheltenham.
Chiswick.
Crewe.
Darlington.
Dewsbury.
Doncaster.
Dover.
East Ham.
Eccles.
Farnham.
Finchley.
Folkestone.
Gravesend.
Grimsby.
Harrogate.
Kidderminster.
Kingston-on-Thames.
Lancaster.
Launceston.
Leamington Spa.
Linlithgow.
Lisburn.
Llanelly.
Mansfield.
Macclesfield.
Mexborough.
Nelson.
Northfleet.
Okehampton.
Panteg.
Penzance.
Poole.
Reigate.
Richmond (Surrey).
Shrewsbury.

Boroughs, etc.—continued.

Stockton-on-Tees.
Taunton.
Tiverton.
Todmorden.
Torquay.
Totnes.
Tottington.
Truro.
Tunbridge Wells.
Tynemouth.
Wakefield.
Wallasey.
Wallsend.
Wath-upon-Dearne.
Windsor.
Wood Green.
Wrexham.
Yeovil.
Yiewsley.

RURAL DISTRICT COUNCILS (13).

Banbury.
Barnstaple.
Basford.
Bridport.
Dartford.
Great Torrington.
Lanchester.
Neath.
Newton Abbot.
Penybont.
St. Austell.
St. Thomas's.
Warmley.

PORT SANITARY AUTHORITIES AND OTHERS (6).

Birkenhead Road Improvement Committee.
Leicester Sewage Works and Farms Committee.
Liverpool Port Sanitary and Hospitals Committee.
London Cattle Markets Committee.
London Port Sanitary Authority.
Richmond (Surrey) Main Sewerage Board.

EDUCATION AUTHORITIES (7).

Ayr School Board.
Birmingham.
Devon C.C.
Exeter.
Govan School Board.
Kesteven C.C.
Southampton.

SOCIETIES, UNIVERSITIES, COLLEGES, ETC. (37).

Child-Study Society London.
Geological Society of London.
Illuminating Engineering Society.
Institution of Municipal and County Engineers.
Institution of Municipal Engineers.
Institution of Water Engineers.
King Alfred School Society.
Midland Counties Veterinary Medical Association.
National Health Society.
National League for Physical Education and Improvement.
Pharmaceutical Society of Ireland.
Poor Law Medical Officers' Association.
Queen's University, Belfast.
Queen Victoria's Jubilee Institute for Nurses.
Royal Institute of Architects, Ireland.
Royal Institute of British Architects.
Royal Irish Academy.
Royal College of Physicians of Ireland.
Royal College of Surgeons in Ireland.
Royal Philosophical Society of Glasgow.
Royal Society of Medicine.
Rural District Councils Association.
Rural Housing Association.
Society of Architects.
Society of Chemical Industry.
Society of Engineers.
Southern Counties Veterinary Medical Society.
Surveyors' Institution.
University College of London.
University of Aberdeen.
University of Birmingham.
University of Durham.
University of Glasgow.
University of Leeds.
University of London.
University of Manchester.
Women's Local Government Society.

Proceedings of the Congress and Officers of Sections and Conferences.

Saturday, July 5th, at 3 p.m.

Opening of the Health Exhibition in the Victoria Hall. BY THE RIGHT WORSHIPFUL THE MAYOR OF EXETER (H. W. Michelmore, Esq.).

Sunday, July 6th.

Special Services in the Cathedral and other Churches.

Monday, July 7th, at 1 p.m.

Reception of the Members and Delegates in the Guildhall. BY THE RIGHT WORSHIPFUL THE MAYOR.

At 1.30 p.m.

Public Luncheon in the Rougemont Hotel. (*Tickets 3s. 6d.*)

THE RIGHT WORSHIPFUL THE MAYOR IN THE CHAIR.

At 8 p.m.

Inaugural Address to the Congress in the Barnfield Hall. BY THE RIGHT HON. EARL FORTESCUE, K.C.B.

Tuesday, July 8th, at 7.30 p.m.

Popular Lecture in the Barnfield Hall. BY THE HON. SIR JOHN M'CALL, M.D., LL.D. (Agent-General for Tasmania), on "Imported Foods, from a Colonial Point of View."

Wednesday, July 9th, at 8.30 p.m.

Conversazione and Reception in the Royal Albert Memorial, at the invitation of the Mayor and Mayoress of Exeter.

Thursday, July 10th, at 8 p.m.

Lecture to the Congress in the Barnfield Hall. BY SIR WILLIAM J. COLLINS, D.L., J.P., M.S., M.D., F.R.C.S. on "The Chadwick School of Thought: An Appeal from the New Sanitarians to the Old."

Friday, July 11th, at 7.30 p.m.

Congress Dinner, in the Rougemont Hotel. (*Tickets 6s.*)

Garden Parties and Visits to Places of Interest.

For times and places of Meetings see pages 109 and 110.

SECTIONAL MEETINGS.

A.—Sanitary Science and Preventive Medicine.

Tuesday and Wednesday, July 8th and 9th, to be held in THE UNIVERSITY COLLEGE.

President.

A. WYNTER BLYTH, M.R.C.S., F.I.C., F.C.S.

Vice-Presidents.

RUSSELL COOMBE, M.A., F.R.C.S.
H. DAVY, M.D., F.R.C.P.
JOHN R. HARPER, M.R C.S.
LEWIS MACKENZIE, F.R.C.S.
PAUL SWAIN, F.R.C.S.
J. SHIRLEY STEELE-PERKINS, M.B.
RAGLAN THOMAS, M.D., D.P.H.

Local Secretaries.

R. V. SOLLY, M.D., F.R.C.S., 40, Southernhay West, Exeter.
H. G. GOULDEN, M.D., D.P.H., Exeter.

Recording Secretary.

CHARLES PORTER, M.D., B.SC., Medical Officer of Health, St. Marylebone.

B.—Engineering and Architecture.

Thursday and Friday, July 10th and 11th, to be held in THE UNIVERSITY COLLEGE.

President.

H. PERCY BOULNOIS, M.Inst.C.E.,
(Late Deputy Chief Engineering Inspector, Local Government Board for England.)

Vice-Presidents.

R. M. CHALLICE.
S. C. CHAPMAN, M.INST.C.E., Water Engineer, Torquay.
CHAS. COLE, M.S.A.
O. A. G. EDWARDS, ASSOC.M.INST.C.E., District Engineer, L.S.W.Rly., Exeter.
E. H. HARBOTTLE, F.R.I.B.A.
FRANK HOWARTH, M.INST C.E., Water Engineer, Plymouth.
JAMES JERMAN, F.R.I.B.A.
J. A. LUCAS, F.S.I., A.R.I.B.A.
E. Y. SAUNDERS, M.R.SAN.I., Borough Surveyor, Barnstaple.
B. PRIESTLEY SHIRES, F.R.I.B.A.

Local Secretaries.

SAMUEL HUTTON, Surveyor and Water Engineer, Exmouth U.D.C.
HARBOTTLE REED, F.R.I.B.A., Castle Street, Exeter.

Recording Secretary.

A. SAXON SNELL, F.R.I.B.A., 9, Bentinck Street, Manchester Square, London, W.

C.—Domestic Hygiene.

Wednesday, July 9th, to be held in THE UNIVERSITY COLLEGE.

President.
THE MAYORESS OF EXETER (Mrs. Michelmore).

Vice-Presidents.

HE COUNTESS OF IDDESLEIGH.	Dr. MABEL GATES.
THE HON. LADY ACLAND.	Mrs. H. ST. MAUR
Mrs. E. F. MORRISON BELL.	Miss J. D. MONTGOMERY.
Miss WALTON EVANS.	Mrs. J. G. OWEN.
Mrs. EVERY.	Mrs. ISABELLA M. TINDALL.

Local Secretary.
Miss EDITH E. GEARE, 39, East Southerhay, Exeter.

Recording Secretary.
Miss EDITH A. TOWNSEND, "The Croft," Whimple, near Exeter.

This Section is open to all Ladies interested in Domestic Hygiene.

D.—Hygiene of Infancy and Child-Study.

Friday, July 11th, to be held in THE UNIVERSITY COLLEGE.

President.
E. J. DOMVILLE, L.R.C.P., M.R.C.S., J.P.

Vice-Presidents.

LADY ACLAND, "Killerton," Exeter.	Mrs. A. T. LORAM.
Miss A. G. BERE.	Mrs. J. MORTIMER.
Professor J. M. FORSTER. B.A.	Mrs. ELEANOR ROBERTSON.
W. P. HIERN, M.A., J.P.	Mrs. C. T. K. ROBERTS.

THE RT. HON. SIR E. M. SATOW, P.C., G.C.M.G., J.P.

Local Secretaries.
Mrs. C. J. VLIELAND, 20, Southernhay West, Exeter.
Miss AMY J. WALKER, M.A., College Hostel, Exeter.

Recording Secretary.
F. E. FREMANTLE, M.A., M.B., F.R.C.P., County Medical Office, Hertford.

This Section is open to all interested in the subject.

CONFERENCES.

I. Municipal Representatives.

Tuesday, July 8th, to be held in THE COUNCIL CHAMBER, GUILDHALL.

President.

THE RIGHT WORSHIPFUL THE MAYOR OF EXETER
(H. W. Michelmore, Esq.).

Vice-Presidents.

THE WORSHIPFUL THE MAYOR OF BARNSTAPLE.
THE WORSHIPFUL THE MAYOR OF BIDEFORD.
THE WORSHIPFUL THE MAYOR OF DARTMOUTH.
THE WORSHIPFUL THE MAYOR OF GREAT TORRINGTON.
THE WORSHIPFUL THE MAYOR OF HONITON.
THE WORSHIPFUL THE MAYOR OF LAUNCESTON.
THE WORSHIPFUL THE MAYOR OF SOUTH MOLTON.
THE WORSHIPFUL THE MAYOR OF TIVERTON.
THE WORSHIPFUL THE MAYOR OF TORQUAY.
THE WORSHIPFUL THE MAYOR OF TOTNES.

Local Secretaries.

Alderman C. R. M. CLAPP, 2, Bedford Circus, Exeter.
A. P. DELL, Clerk, Teignmouth U.D.C.

Recording Secretary.

H. LLOYD PARRY, Town Clerk, Exeter.

This Conference is open to all Members and Officials of Municipal Bodies.

II. Medical Officers of Health.

Thursday, July 10th, to be held in THE UNIVERSITY COLLEGE.

President.

GEORGE REID, M.D., D.P.H.
(County Medical Officer of Health, Staffordshire).

Vice-Presidents.

L. P. BLACK, M.B., D.P.H.
G. T. CLAPP, M.B., M.R.C.S.
O. HALL, D.P.H., LL.D., B.L., M.O.H. Devonport.
W. H. PRILE, M.D., D.P.H., M.O.H. Sidmouth.
S. NOY SCOTT, L.R.C.P., D.P.H., M.O.H. Plympton St. Mary.
EDMUND M. SMITH, M.D., D.P.H., M.O.H. York.
C. J. VLIELAND, M.D., J.P.
F. M. WILLIAMS, L.R.C.P., D.P.H., M.O.H. Plymouth.
E. H. YOUNG, M.D., D.P.H., M.O.H. Okehampton.

Local Secretaries.

EDWARD A. BRASH, M.R.C.S., Medical Officer of Health, Exeter.
THOMAS DUNLOP, M.B., C.M., D.P.H. „ „ Torquay.

Recording Secretary.

A. WELLESLEY HARRIS, M.R.C.S., D.P.H., Medical Officer of Health, Lewisham.

This Conference is open to all Medical Officers of Health.

III. Engineers and Surveyors to County and other Sanitary Authorities.

Tuesday, July 8th, to be held in THE UNIVERSITY COLLEGE.

President.

THOMAS MOULDING, M.Inst.C.E.
(City Engineer and Surveyor, Exeter).

Vice-Presidents.

ALBERT E. BROOKES, County Surveyor, Cornwall C.C.
H. T. CHAPMAN, C.E., County Surveyor, Wells, Somerset.
DAVID EDWARDS, ASSOC.M.INST.C.E., Borough Engineer, Taunton.
H. A. GARRETT, ASSOC.M.INST.C.E., Borough Surveyor, Torquay.
FRANCIS PARR, ASSOC.M.INST.C.E., Borough Surveyor, Bridgwater.
JAMES PATON, C.E., Borough Surveyor, Plymouth.
JOHN SIDDALLS, C.E., Borough Surveyor and Sanitary Inspector, Tiverton.
F. W. SPURR, M.I.M. & C.E., City Engineer and Surveyor, York.

Local Secretaries.

W. P. ROBINSON, Assoc.M.Inst.C.E., County Surveyor (N. Division), 22, Queen Street, Exeter.
ROBT. H. DYMOND, Assistant City Surveyor, Exeter.

Recording Secretary.

J. S. BRODIE, M.INST.C.E., Borough Engineer, Blackpool.

This Conference is open to all Municipal and County Engineers.

IV. Veterinary Inspectors.

Wednesday, July 9th to be held in THE UNIVERSITY COLLEGE.

President.

PROF. J. PENBERTHY, F.R.C.V.S.

Vice-Presidents.

THE RT. HON. GEORGE LAMBERT, P.C., M.P.
A. T. LORAM, J.P., Aylesbeare.
W. TREMLETT, Crediton.
BERNARD N. WALE, B.SC., Principal of Seale-Hayne College, Newton Abbot.

Local Secretaries.

WM. ROACH, F.R.C.V.S., Veterinary Inspector, Exeter.
H. KIDD, F.R.C.V.S., Exmouth.

Recording Secretary.

J. A. DIXON, M.R.C.V.S., Veterinary Inspector, Leeds.

This Conference is open to all Members of the Veterinary Profession.

V. Sanitary Inspectors.

Thursday, July 10th, to be held in THE UNIVERSITY COLLEGE.

President.

JAMES ROBINSON
(County Health Inspector, Durham C.C.)

Vice-Presidents.

T. LINNINGTON ASH, J.P., L.R.C.P., M.R.C.S., C.C, Holsworthy, Member of County Public Health Committee.
Rev. Preby. F. F. BUCKINGHAM, J.P., C.C., Deputy Chairman of County Council, Public Health Committee.
W. G. COOPER, Chief Sanitary Inspector, Bournemouth.
J. T. COWDEROY, Chief Sanitary Inspector, Kidderminster.
A. E. HUDSON, Chief Sanitary Inspector, Cheltenham.
S. J. JAMES, Sanitary Inspector, Sherborne R.D.C.
J. W. KIRLEY, Chief Sanitary Inspector, Bristol.
J. M. METHERELL, C C., Member of County Public Health Committee.
Alderman T. C. PRING.
FRANK THOMPSON, Chief Sanitary Inspector, Birmingham.
C. E. THORNYCROFT, J.P.

Local Secretaries.

ARTHUR E. BONHAM, M.S.I.A., Chief Inspector of Nuisances, Exeter.
E. H. QUICK, Sanitary Inspector, St. Thomas R.D.C., 9, Bedford Circus, Exeter.

Recording Secretary.

W. J. ADDISCOTT, Chief Inspector of Nuisances, Plymouth.

This Conference is open to all Sanitary Inspectors and Inspectors of Nuisances.

The following privileges will be granted to Members and Delegates on production of their Congress Tickets:—

Free Use of the following Clubs, etc.:—

Exeter Literary Society; Devon and Exeter Institution; Constitutional Club; Devonshire Liberal Club.

The following Golf Courses in the neighbourhood of the City are available for use upon conditions to be ascertained from the Honorary Local Secretaries:—

Exeter Golf Club, Pennsylvania (1½ miles from Guildhall).
The Warren (Seaside Links): Train (25 minutes) to Dawlish Warren.

Inspection of various Institutions and Public Buildings.

(*See subsequent Local Programme.*)

Order of Proceedings.

SATURDAY, JULY 5TH.

3 p.m.—Opening of the Health Exhibition, in the Victoria Hall.

SUNDAY, JULY 6TH.

Special Services in the Cathedral, and other Churches, full particulars of which will be given in the Local Programme.

MONDAY, JULY 7TH.

1 p.m.—Reception of Members and Delegates in the Guildhall, by the Right Worshipful the Mayor.

1.30 p.m.—Public Luncheon, in the Rougemont Hotel. (Tickets 3s. 6d.)

3 to 5.30 p.m.—Conducted parties to places of interest in the City.—Tea at the Guildhall.

8 p.m.—Inaugural Address to the Congress, in the Barnfield Hall, by the Right Hon. Earl Fortescue, K.C.B.

TUESDAY, JULY 8TH.

10 a.m.—Meetings of:—

Section A.—Sanitary Science and Preventive Medicine, in the University College.

Conferences of Municipal Representatives in the Guildhall, and of Engineers and Surveyors in the University College.

4 p.m.—Garden Party at Rougemont, at the Invitation of the Sheriff of Exeter and Mrs. Every.

7.30 p.m.—Popular Lecture in the Barnfield Hall, by
The Hon. Sir John M'Call, M.D., LL.D., on
"Imported Foods from a Colonial Point of View."

WEDNESDAY, JULY 9TH.

8.15 a.m.—Breakfast at Invitation of the National Temperance League.

10 a.m.—Meetings of Sections—

A.—Sanitary Science and Preventive Medicine.

C.—Domestic Hygiene.

Conference of Veterinary Inspectors in the University College.

1.30 p.m. and later.—Excursions:—

By brake over Woodbury Common.
By train to Hennock Waterworks.
By train to the landslip at Lyme Regis and Rousdon.
By brake to City Waterworks at Pynes.
Excursion by boat to Turf.

Parties will also be formed to visit other City Works.

8.30 p.m.—Conversazione and Reception, in the Royal Albert Memorial, at the invitation of the Mayor and Mayoress of Exeter.

THURSDAY, JULY 10TH.

10 a.m.—Meetings of Sections—

B.—Engineering and Architecture,

Conferences of Medical Officers of Health and Sanitary Inspectors in the University College.

4 p.m.—Garden Party at "Maryfield," Exeter, by invitation of H. E. Duke, Esq., K.C., M.P.

Garden Party at Shobrooke Park, Crediton, by invitation of Sir John and Lady Shelley.

Garden Party at Mamhead, on the invitation of Sir Robert L. Newman, Bart.

Garden Party at Rosamondford, Aylesbeare, by invitation of A. T. Loram, Esq., J.P.

8 p.m.—Lecture to the Congress, in the Barnfield Hall, by Sir William J. Collins, D.L., J.P., F.R.C.S., M.D., D.P.H., on "The Chadwick School of Thought—an appeal from the new Sanitarians to the old."

FRIDAY, JULY 11TH.

10 a.m.—Meetings of Sections—

B.—Engineering and Architecture,

D.—Hygiene of Infancy and Child-Study, in the University College.

1 p.m.—Closing Meeting, in the Guildhall.

3.30 p.m.—Garden Party in the Palace Grounds.

5.30 p.m.—During the afternoon parties will be formed to be shown round the Cathedral, and at 5.30 there will be an Organ Recital.

7.30 p.m.—Congress Dinner, in the Rougemont Hotel. (Tickets 6s. each.)

SATURDAY, JULY 12TH.

Excursion to Totnes by train, by steamer down the Dart River to Dartmouth, returning by Torquay.

Excursion to Dartmoor and through the Lydford Gorge.

N.B.—Full particulars of Receptions, Excursions, etc., will be given in the Local Programme.

The following Set Subjects have been arranged for Discussion in:—

SECTIONS.

A.—Sanitary Science and Preventive Medicine.

"Tuberculosis and Sanatoria Benefit," to be opened by Arthur Latham, M.A., M.D., F.R.C.P., and Philip Boobbyer, M.D., M.S.

"Poisoning from Shell-fish in Tidal Waters," to be opened T. Dunlop, M.B., D.P.H., M.O.H. Torquay.

B.—Engineering and Architecture.

"Water Supply from Rivers," to be opened by William Phelps.

"Open-air Residential Schools."

C.—Domestic Hygiene.

"Domestic Labour-saving Appliances," to be opened by Miss E. P. Hughes.

D.—Hygiene of Infancy and Child-Study.

"Dental Hygiene in Infancy and Childhood," to be opened by J. Sim Wallace, D.Sc., M.D., L.D.S.

CONFERENCES.

I.—Municipal Representatives.

"The financial aspect of Housing for the Working Classes," to be opened by Henry R. Aldridge.

1. "In Small Urban Districts."
2. "In Rural Districts."

II.—Medical Officers of Health.

"Recent Legislation as affecting Public Health Administration," to be opened by Herbert Jones, L.R.C.S.I., D.P.H., M.O.H. Herefordshire Combined Districts.

III.—Engineers and Surveyors.

"Town Planning."

IV.—Veterinary Inspectors.

"Milk and Dairies Bill."

V.—Sanitary Inspectors.

"Sanitary Administration in Rural Districts," to be opened by E. Plummer Davies, Sanitary Inspector, Tisbury R.D.C.

THE ROYAL SANITARY INSTITUTE.

REVIEWS OF BOOKS.

A Text-Book on Trade Waste Waters.*

The somewhat ambitious title is quite justified in this case, as it is a clear and comprehensive manual on the subject, by writers with long and extended experience of the remedies for rivers pollution, and the working of the Acts at present available when compulsion is necessary. It is remarked that up to the middle of last century trade wastes were poured, practically without restraint, into the nearest streams, and the nuisance became so intolerable that the Government, after two Royal Commissions, passed the Rivers Pollution Prevention Act, of 1876. This, however, remained inoperative until nearly twenty years after, when certain local committees acquired the authority to enforce its provisions. Even at present, legal proceedings against stream polluters are often uncertain, owing to reservations and saving clauses in the enactments. It is well known that the Royal Commission now sitting lays stress on the appointment of a Central Authority, and of Rivers Boards throughout the country, and we gather that a Bill is already prepared on the basis of the Commission's Report.

After an interesting summary of legal aspects, the authors describe the processes giving rise to the waste waters, and the methods of purification. Chapters II. and III. deal with the coal trade and gas making; chapter IV. with effluents from breweries and distilleries, including grain washing; then follow in five chapters leather, paper, and textile industries. Chapter X., "miscellaneous," compresses within thirty-three pages twenty-nine different trades, some of them very important, and mentions at the end several other ones that give polluting wastes. But the observation is made on p. 6 that means which are successful in dealing with one kind of refuse may be equally applicable to others. A general account is given in chapter XI. of the chief mechanical appliances for the purpose, including evaporators and incinerators, with brief but valuable criticisms of the methods of treatment by precipitation, septic tanks, filters, and on land. The law and practice as to discharge into public sewers is next discussed, with local examples and tables of analysis. The authors quote some of their original investigations, and while agreeing with the common experience that many kinds of trade refuse are much more difficult to and therefore more costly to purify than ordinary domestic sewage, they point out several ways in which the expense can be lessened, and may even be turned into a profit by recovery of by-products. They remind us that for all sanitary authorities the cost and difficulty of sewage disposal tends to be much increased by trade discharges for two reasons: (1) as admitted by the Royal Commission of 1898 in their Fifth Report, p. 192, when they say that all the trade effluents of which they have had experience interfere with or retard processes of purification to some extent; (2) that these discharges

* A Text-Book on Trade Waste Waters, their nature and disposal, by H. Maclean Wilson. M.D., B.Sc., Chief Inspector, West Riding of Yorkshire Rivers Board, and H. T. Calvert, M.Sc., Ph.D., F.I.C., Chief Chemical Assistant to the Board. 8vo., 13 chapters, 340 pp. 74 illustrations, including 22 plates. Chas. Griffin & Co. Price 18s. net.

greatly augment the sludge. "For example, in twelve towns where domestic sewage only is treated, and where precipitants are used, the average quantity of sludge produced annually is one ton for every twelve persons, whereas in other twelve towns where there is a large admixture of trade refuse," with conditions otherwise similar, "one ton of sludge is produced annually for every six persons" (p. 310). Therefore, sanitary authorities are justified in requiring manufacturers to purify their refuse before discharging it into the sewers, or else to pay towards the extra cost of sewage disposal, "and the manufacturer who can thus get rid of his trade refuse is in a much better position than one who is obliged to purify it effectively so as to be able to discharge it into a stream." A section on methods of analyses and limits of impurity or standards concludes a well-written and usefully illustrated work. There are tables of the average composition of most of the different wastes, and an unusually full bibliography at the end of each section. At the same time the comprehensive value of the book would have been increased if some of the subjects had been treated with less brevity. S. R.

Modern Sanitary Engineering and Plumber's Work, I. & II.*

These volumes contain 16 and 20 plates, respectively, drawn to scale, illustrating various joints, fittings, and details relating to sanitary work, warming apparatus, water supply, etc. The plates have evidently been prepared to supplement courses of lectures to students, and as such will no doubt serve their purpose, but to the practical man their utility is limited.

It is as important to instruct students in the obsolete examples as in the more modern requirements, to enable them to appreciate the importance of the numerous small details which make for efficiency in modern fittings. The authors appear to have realised this point to the exclusion of many of the fittings in general use, which would have been more useful than, say, the six plates illustrating hot-water engineer's work.

The Model By-laws prohibit certain antiquated fittings, illustrations of which might well have been included, as students are often at a loss to identify them.

Considerable time and trouble have been expended in preparing the plates, but it is to be regretted that several of them were not compared with the actual fittings before going to press. F. O. S.

Guide to Factory Inspectors' Examination.†

This little book should be found useful both by those desirous of obtaining information with regard to the appointment of factory inspector and those preparing for the examination. For the former there are provided particulars of appointments; and the latter are given hints on when, how, and where to study, on what to study, and how to deal with the examination and the examination papers. Of these last, specimens are given, and should prove of interest to intending candidates. C. P.

---

* Modern Sanitary Engineering and Plumber's Work, I. and II., by A. Herring Shaw and H. F. V. Newsome. Longmans, Green, and Co. Price 2s. 6d. each.

† Guide to Factory Inspectors' Examination, by John Henry Crabtree. 196 pp., 8vo. Second edition. London: Eyre and Spottiswoode, Ltd. Price 3s.

MEETINGS HELD.

EXAMINATIONS.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses have been held at:—

Christchurch, March 13th and 14th.
Belfast, May 30th and 31st.
Leeds, June 6th and 7th.
Birmingham, June 13th and 14th.
Liverpool, June 20th and 21st.

For Inspectors of Meat and Other Foods:—
Adelaide, March 27th, 28th, and 31st.

At these Examinations 192 candidates presented themselves, and the following were awarded certificates:—

Sanitary Science as applied to Buildings and Public Works.

ASHBROOK, HENRY ALFRED.
BENDALL, JOHN LIONEL.
GREENWOOD, FREDERICK.
HUMPHREYS, JOHN PARRY.
WHITSITT, ROBERT.

School Hygiene, including Elementary Physiology.

BARTHOLOMEW, CATHERINE.
BRETT, LILIAN ROCHE.
CARNAGHAN, E. C. WINIFRED.
CARRUTHERS, GERTRUDE IRENE CAMERON.
COPPING, BETTY.
COX, ALISON BREADMORE.
DAVIS, E. MAY.
FLETCHER, ETHEL.
GRAHAM, MARY.
GREY, LILIAN.
GRIMSHAW, HELEN MAUDE.
GWYNNE, KATHLEEN RUDYARD.
HUGHES, MINNIE ALYSIA.
HUNT, LUCY MYRTILLA.
HUNTER, HAROLD.
JACKSON, MARY ALICE.
JAY, ARCHIBALD.
JONES, GLADYS OLIVE.
KAY, ETHEL.
KERIN, NORA.
KEYS, CELIA MAUD.
MCCONVILLE, ALICE.
MAUDSLEY, ELSIE FLORENCE.
MELLOR, MARJORIE CLOWES.
MILLAR, RUTH ELIZABETH.
MONKMAN, DOROTHY.
MORRIS, HAROLD HULSE.
MORRISON, JESSIE ANNIE.
O'KELLY, KATHLEEN.
OSLER, HELEN FRANCES.
OVERTON, OLIVE MARION.
PALMER, MARY CHARLOTTE.
POTTS, GWENDOLINE BERTHA S. BURDON.
PRIESTMAN, JEANETTE.
ROBINSON, MARGARET.
THOMPSON, IDA HELEN.
TYREMAN, MARY.
WILKINSON, WILLY.
WILLIAMSON, AGNES.

Women Health Visitors and School Nurses.

BOUSFIELD, ELIZABETH.
BROWN, MARIA ETHEL.
BUTLER, HELEN.
CHATWIN, MARY WINIFRED.
DAVIESON, ETHEL ANNIE.
DAVIS, GERTRUDE NELLIE.
FARMER, ELEANOR CHARLOTTE.
FISHER, CATHERINE HANNAH.
FLOCKTON, ALICE ELIZABETH.
GREGSON, PHŒBE GERTRUDE.
GRIFFIN, ANNIE ROSETTA EDRIS.
INSTON, EMMA.

Jackson, Eleanor.
Mackay, Christina Helen.
Markham, Amy May.
Mills, Mary E.
Schun, Emma Louise.
Smith, Elsie.
Stocking, Emily Charlotte.
Watson, Florence.
Webster, Katharine May.

Inspectors of Nuisances.

Anderson, Susanna Graham.
Audsley, Percival Harold.
Bailey, Alfred Horace.
Barrand, Tom.
Bennett, William.
Bent, Ted.
Brennan, Sarah Ellen.
Brunskill, Elsie Hamilton.
Bullen, Alice.
Cartlidge, Thomas Fryer.
Cheesman, Beatrice Louise.
Chudleigh, Mary Elizabeth.
Clarke, Henry.
Davies, John Henry.
Dyer, Joseph Herbert.
Fletcher, Annie.
Fowler, Hartley Harman.
Garner, Harriet Helen.
Greathead, Arthur.
Heath, Frederick William.
Hedley, Alfred Robert.
Henry, William.
Hoole, James George.
Horbury, Frank.
Jackson, George.
Jacques, John Joseph.
Johnson, Edgar Norman.
Leonard, Lily.
McDonald, George Alfred.
Makin, Miriam.
Maguire, Clare.
Marshall, James.
Mason, Alfred.
Micklethwaite, George William.
Millar, Martha Eagleson.
Millen, Rankin.
Miller, Matilda.
Moorhouse, Edwin.
Morton, Emmeline Harriett Fleming.
Newbould, Edwin.
Nicholl, Elizabeth Isdale.
Oldfield, Wilfred.
Scott, Harry Barnard.
Taylor, Wilfred.
Thorp, Sarah Swallow.
Walker, George Alexander McCartney.
Walker, Alexander Mitchell.
Watson, Percy William.
Whiteley, Cyril.
Whittington, Hugh Knight.
Wilkinson, Ethel Ellen.
Williamson, Harold Edward
Wilson, William Smith.
Woodcock, Percy Alwyn.
Wright, Percival William.

Inspectors of Meat and Other Foods.

Lowe, William Raymond.
Marshall, Alexander Ross.
Pearce, Edward Alfred.

FORTHCOMING MEETINGS.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors Qualifying for Membership, for Inspectors of Nuisances, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses:—

London, July 25th and 26th.

For Inspectors of Meat and Other Foods:—

Birmingham, July 18th and 19th.

CALENDAR FOR JULY, 1913.

As far as at present arranged.

JULY.

7-12. **Congress and Exhibition,** EXETER. President: The Right Hon. Earl Fortescue, K.C.B. (Lord-Lieutenant of Devonshire).

PROGRAMME OF ARRANGEMENTS.

5 S. 10 a.m.—Reception Room opens.
3 p.m.—Opening of the Health Exhibition, in the Victoria Hall.

6 Su. Special Services in the Cathedral, and other Churches, full particulars of which will be given in the Local Programme.

7 M. 1 p.m.—Reception of Members and Delegates in the Guildhall, by the Right Worshipful the Mayor.
1.30 p.m.—Public Luncheon, in the Rougemont Hotel. (Tickets 3s. 6d.)
3 to 5.30 p.m.—Conducted parties to places of interest in the City.—Tea at the Guildhall.
8 p.m.—Inaugural Address to the Congress, in the Barnfield Hall, by the President, the Right Hon. Earl Fortescue, K.C.B.

8 Tu. 10 a.m.—Meetings of Sections and Conferences:—A.—Sanitary Science and Preventive Medicine; Municipal Representatives and Engineers and Surveyors.
4 p.m.—Garden Party at Rougemont, at the invitation of the Sheriff of Exeter and Mrs. Every.
7.30 p.m.—Popular Lecture in the Barnfield Hall, by the Hon. Sir John McCall, M.D., LL.D., on "Imported Foods from a Colonial Point of View."

9 W. 10 a.m.—Meetings of Sections and Conferences:—A.—Sanitary Science and Preventive Medicine; C.—Domestic Hygiene; and Veterinary Inspectors.
1.30 p.m. and later.—Excursions:—
By brake over Woodbury Common.
By motor char-à-banc to Hennock Waterworks.
By train and brakes to the landslip at Lyme Regis.
By brake to City Waterworks at Pynes.
Excursion by boat to Turf.
By rail to Teignmouth, and conveyances to Mylor Waterworks.
Parties will also be formed to visit other City Works.
8.30 p.m.—Conversazione and Reception, in the Royal Albert Memorial, at the invitation of the Mayor and Mayoress of Exeter.

10 Th. 10 a.m.—Meetings of Sections and Conferences:—B.—Engineering and Architecture; Medical Officers of Health and Sanitary Inspectors.
4 p.m.—Garden Party at "Maryfield," Exeter, by invitation of H. E. Duke, Esq., K.C., M.P.
Garden Party at Shobrooke Park, Crediton, by invitation of Sir John and Lady Shelley.
Garden Party at Mamhead, on the invitation of Sir Robert L. Newman, Bart.
Garden Party at Rosamondford, Aylesbeare, by invitation of A. T. Loram, Esq., J.P.
8 p.m.—Lecture to the Congress, in the Barnfield Hall, by Sir William J. Collins, D.L., J.P., F.R.C.S., M.D., D.P.H., on "The Chadwick School of Thought—an appeal from the new Sanatarians to the old."

11 F. 8.15 a.m.—Breakfast at invitation of the National Temperance League.
10 a.m.—Meetings of Sections:—B.—Engineering and Architecture; D.—Hygiene of Infancy and Child-Study.
1 p.m.—Closing Meeting in the University College.
3.30 p.m.—Garden Party in the Palace Grounds.
5.30 p.m.—During the afternoon parties will be formed to be shown round the Cathedral, and at 5.30 there will be an Organ Recital.
7.30 p.m.—Congress Dinner in the Rougemont Hotel.

12 S. Excursion to Totnes by train, by steamer down the Dart River to Dartmouth, returning by Torquay.
Excursion to Dartmoor, including drive from Tavistock to Princetown.

---

18 F., 19 S. } Examination for Inspectors of Meat and other Foods—Birmingham.

25 F., 26 S. } Examinations—London.

The Library will be closed from July 1st–30th.

LIST OF FELLOWS, MEMBERS, AND ASSOCIATES

ELECTED JUNE, 1913.

FELLOWS.

Reg. No.	Date of Election.	
3230	1912. *F 1913. June.*	ASTOR, Waldorf, M.P., *Cliveden, Taplow, Bucks.*
771	1893. *F 1913. June.*	BROWNRIDGE, Charles, M.INST.C.E., F.G.S., *Town Hall, Birkenhead.*
2319	1910. *F 1913. June.*	FAWCUS, Major Harold B., R.A.M.C., M.B., B.S.DURHAM, D.P.H.CAMB., *Royal Army Medical College, Grosvenor Road, S.W.*
3094	1911. *F 1913. June.*	FAYRER, Lt.-Col. Sir Joseph, Bart., R.A.M.C.(R.), M.A.CAMB., M.D.ST.AND., F.R.C.S.EDIN., *Meadow Walk, Edinburgh.*
2720	1909. *F 1913. June.*	FLETCHER, Banister Flight, F.R.I.B.A., F.S.I., F.R.G.S., F.R.HIST.S., 29, *New Bridge Street, Ludgate Circus, E.C.*
3165	1912. *F 1913. June.*	HAMER, William Heaton, M.D., M.A.CAMB., B.SC. LOND., D.P.H.CAMB., (*M.O.H.*), 55, *Dartmouth Park Hill, N.W.*
338	1888. *F 1913. June.*	HASLAM, Lewis, M.P., J.P., 8, *Wilton Crescent, S.W.*
2817	1910. *F 1913. June.*	MIVART, Frederick St. George, F.R.C.S.EDIN., M.D., 13, *Stafford Terrace, Kensington, W.*
2158	1908. *F 1913. June.*	SWINDLEHURST, Joseph Eaves, M.INST.C.E., *St. Mary's Hall, Coventry.*
3012	1911. *F 1913. June.*	WOODRUFF, Prof. Harold Addison, M.R.C.S., L.R.C.P., M.R.C.V.S., *The University, Melbourne, Australia.*

MEMBERS.

*** Marked thus have passed the Examination in Sanitary Science as applied to Buildings and Public Works.**

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

***M* Marked thus have passed the Examination of the Institute for Inspectors of Meat and Other Foods.**

3162 1913. June. AHMED, Sheikh Fateh, B.SC.(ENG.)GLASG., 104, *Hill Street, Garnet Hill, Glasgow.*

3163 1913. June. AINSWORTH, Ralph Bignall (*Capt., R.A.M.C.*), M.R.C.S., L.R.C.P., D.P.H., *Army District Laboratory, Tidworth House, Tidworth, Andover.*

3164 1913. June. BRANDER, William, M.D., M.B., B.CH., *Medical Superintendent, Hackney Union Infirmary, Homerton, N.E.*

3173 1913. June*‡ BROWN, Arthur George Gray, 38, *Culverden Park Road, Tunbridge Wells.*

Reg. No. Date of Election.

3474 1913. June. *M* BURRELL, Horace, M.R.C.V.S., 59, *Seymour House, Compton Street, Brunswick Square, W.C.*

3475 1913. June. *M* COCKSHOTT, Arthur Maurice (*Capt., A.S.C.*), *Army Service Corps, Bulford, Salisbury.*

3476 1913. June. *DENYER, John, 12, *Milner Road, Sherwood, Nottingham.*

3465 1913. June ‡ *M* FRANKLIN, Edward James, *Council Offices, Church End, Finchley, N.*

3477 1913. June. *M* LLOYD, Arthur Cartwright, M.R.C.V.S., 43, *Beresford Road, Hornsey, N.*

3466 1913. June. MATHIESON, D. Morley, M.A., M.D.EDIN., D.P.H., (*M.O.H.*), *Municipal Buildings, South Shields.*

3478 1913. June. *M* MILNE, Alfred Seton, M.R.C.V.S., *Wheatbridge House, 68, Croal Street, Georgetown, Demerara.*

3467 1913. June. MOSER, William, 294, *Scotland Road, Nelson, Lancs.*

3468 1913. June. REID, James Campbell, F.R.I.B.A., *Northern Polytechnic Institute, Holloway, N.*

3479 1913. June *‡ RESTALL, Edward Bernard, 47, *Linden Avenue, Wembley Hill, Middlesex.*

3469 1913. June. SCAIFE, Edgar John, A.R.I.B.A., 6, *Rushton Road, Bolton.*

3470 1913. June. SHORTALL, John Francis, "*Midburn*," *Brittas, Dublin.*

3471 1913. June ‡ *M* SMITH, Henry Phillips (*Capt., R.A.*), 17, *Mardyke Parade, Cork.*

3472 1913. June. WONG, Chung Yik, M.B., CH.B., D.T.M.&H., D.P.H., 5, *Park Range, Victoria Park, Manchester.*

ASSOCIATES.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

V Marked thus have passed the Examination of the Institute for Women Health Visitors and School Nurses.

M Marked thus have passed the Examination for Inspectors of Meat and Other Foods.

S Marked thus have passed the Examination of the Institute in School Hygiene, including Elementary Physiology.

6225 1913. June. ‡ BALDWIN, Lionel Douglas, 9, *Springfield Road, Harrow.*

6226 1913. June. *V* BECK, Miss Mabel Constance, *Chelsea Hospital for Women, Fulham Road, S.W.*

6227 1913. June. ‡ BLANCHARD, Louis Matthew, 231, *High Street, Plumstead, S.E.*

6228 1913. June. ‡ BROWN, Athelstan Wharton Dodgson, *Shire Engineer, Swan Hill, Victoria, Australia.*

6229 1913. June. ‡ CAMERON, Kenneth, *Government Department of Public Health, Dunedin, New Zealand.*

6230 1913. June. *V* CONNOLLY, Miss Julia, *Brook Fever Hospital, Shooter's Hill, Woolwich.*

6231 1913. June. *M* EVANS, John Jenkin, *Tan-yr-eithen*, 15, *Baker Street, Aberystwyth.*

6232 1913. June. ‡ JOHNSON, Stanley Hugh, 56, *New King's Road, Fulham, S.W.*

Reg. No. Date of Election.

6233 1913. June. ‡JOHNSON, William, *Sanitary Inspector, Stockton, New South Wales.*

6234 1913. June. ‡JOWETT, Miss Lilian, 72, *Harehills Terrace, Leeds.*

6235 1913. June. *s* KYDD, Miss Muriel Carrie, *Physical Training College*, 37, *Lansdowne Road, Bedford.*

6236 1913. June. ‡LENNOX, Percival Gilbert, *Suffolk Avenue, Coburg, Victoria, Australia.*

6237 1913. June. ‡McCOUBRIE, Robert W. H. C., "*Tasma*," 50, *Curzon Street, North Melbourne, Victoria.*

6238 1913. June. *M* PRATT, George Henry, 74, *Median Road, Clapton, N.E.*

6239 1913. June. *s* ROSSELET, Mrs. Agnes Mary, *Gwalior, C.I., India.*

6240 1913. June. ‡SHINER, Miss Christine Alice, *Blackshott Lodge, Grays, Essex.*

6241 1913. June. *V* SMITH, Miss Constance Winifred, 35, *Dalmore Road, Dulwich, S.E.*

6242 1913. June. *s* SYMONS, Miss Mary Irene, *Physical Training College*, 37, *Lansdowne Road, Bedford.*

6224 1913. June. TAYLOR, Walter Samuel, 17, *Wave Crest, Whitstable, Kent.*

6243 1913. June. ‡WEBB, John L., 9, *Falkland Avenue, Church End, Finchley, N.*

6244 1913. June. ‡WILLIAMS, Miss Doris Mary, 8, *Park Road, Whalley Range, Manchester.*

6245 1913. June. *V* WISE, Miss Florence E., 24, *Selby Road, Anerley, S.E.*

6246 1913. June. *M* WOOD, Alfred Ernest, 393, *East India Dock Road, Poplar, E.*

6247 1913. June. *M* WOOD, James, 23, *Hawthorn Street, Newcastle-on-Tyne.*

THE ROYAL SANITARY INSTITUTE.

REVIEWS OF BOOKS.

REPORT UPON A STUDY OF THE DIET OF THE LABOURING CLASSES IN THE CITY OF GLASGOW.*

This very instructive report on the diet of the labouring classes of Glasgow bears evidence of considerable thought; and a mass of detail, difficult to acquire under the circumstances, has been brought together with commendable accuracy. As pointed out by Professor Noël Paton in the introduction, dietary studies among the poorer classes require endless tact and scrupulous care on the part of the organisers and the visitors. Undoubtedly Miss Lindsay has overcome such difficulties, and has thus been able to place the results of very valuable work at our disposal.

The method of study in the present investigation was that adopted by Professor Noël Paton, Dr. Dunlop, and Miss Elsie Inglis in a study of the labouring classes in Edinburgh, on the lines devised by W. O. Atwater in America, and certainly none better could have been selected.

The object of the report was not to compare the diets of the poorer classes of Glasgow with those of other countries, but to determine whether these working classes received an adequate and suitable diet; and, if not, whether any improvement could be suggested without unduly increasing the cost.

The tables given show that although the labouring classes with a regular income of over twenty shillings a week generally manage to secure a diet approaching the proper standard for active life, those with a smaller, and those with an irregular income, entirely fail to procure a sufficient supply of food for the proper development and growth of body, or for the maintenance of a capacity for active work. Of the families whose weekly income was under twenty shillings or irregular, 62·5 per cent. had a diet the energy value of which was less than 3,000 calories. In the case of some very poor families, it was clearly shown that their incomes, after paying for rent, taxes, coal, etc., were quite inadequate to provide a sufficiency of food.

It is stated that a distinct decrease in the consumption of oatmeal porridge was observed, which may possibly be due to want of means. The average amount of oatmeal per man per day was small, amounting to less than one ounce, whereas five to eight ounces would not be in any way excessive under ordinary circumstances.

---

* **Report upon a Study of the Diet of the Labouring Classes in the City of Glasgow, carried out during 1911-1912. By Dorothy E. Lindsay. B.Sc. Issued by authority of the Corporation, 1913.**

The diets also showed a want of variety in most of the households, and oatmeal appeared to be replaced to a great extent by tea, bread, and jam.

With regard to the possibility of improving these diets, Miss Lindsay is of opinion that protein-rich animal foods are all too expensive for the labouring classes, and that any increase in their amount in the diet is impracticable. Cheese, oatmeal, peas, and beans should be more freely used, but if the diet of the labouring classes is to be improved without increasing the cost, time and labour must be expended on properly cooking these more nutritive vegetable foods, which, as is well recognised, require extra attention in their preparation. To secure value and variety, better marketing is required, and the necessary information could be circulated by the free distribution of leaflets, such as "How to spend a shilling on food to the best advantage," prepared for Rowntree in York. W. W. O. B.

Nursery Hygiene.*

The demand for a second edition of this Manual of Nursery Hygiene only two years since the issue of the first edition is sufficient evidence of its popularity. Indeed, the book is one of the best of its class, and should prove very useful to mothers, district visitors, and health visitors. Sufficiently comprehensive in scope, simple and practical in treatment, with sound views expressed—even on such subjects as Pasteurised and condensed milk—the writer has exceedingly well performed the task which he set himself. In a subsequent edition the book would not suffer from the deletion of fig. 25. H. R. K.

Chloride of Lime in Sanitation.†

This valuable and up-to-date monograph commences with 77 pages of connected chapters on the various aspects of the subject, written in an interesting style, and giving comprehensive information. The history of chloride of lime and of its applications is first detailed from the standpoint italicised on p. 7, that this agent "*does not act by its chlorine, but by its oxygen. Its action is not chlorination, but oxidation.*" Separate sections describe the uses for water and sewage purification, in house, farm, and general sanitation, and in surgery, and its relation to epidemics. The regulations in different countries are too scantily treated, probably because it is stated (p. 60) that "our Federal Government has not formulated any regulations." A special section of nine pages is devoted to the danger of the house-fly as a source of infection, and how it can be combated, pointing out the value of disinfecting garbage with chloride of lime, which should be distributed for this purpose.

The succeeding portion of the book gives very useful and well-arranged abstracts of recent literature on the subject, and the name index shows how extensive have been the references. S. R.

---

* Nursery Hygiene, by W. M. Feldman, M.B., B.S.Lond., M.R.C.S., L.R.C.P. Illustrated. 168 pp. London: Bailliere, Tindall & Cox. 1912.

† Chloride of Lime in Sanitation, by Albert H. Hooker, Technical Director of the Hooker Electrochemical Co., Niagara Falls. 8vo., 231 pp. John Wiley & Sons, New York. 1913.

MEETINGS HELD.

Congress and Exhibition at Exeter.

The Twenty-eighth Congress and Exhibition of the Institute was held at Exeter from July 5th to 12th, 1913, under the Presidency of The Right Hon. Earl Fortescue, K.C.B., Lord Lieutenant of Devonshire.

His Worship the Mayor (H. W. Michelmore, Esq.) performed the opening ceremony of the Health Exhibition in the Victoria Hall on Saturday, July 5th.

Very suitable accommodation was provided for the meetings in the University College, Guildhall, Victoria Hall, and the Royal Albert Memorial; and excellent arrangements were made for the reception and convenience of members and delegates.

Special Services were held in the Cathedral (Preacher, The Lord Bishop The Right Rev. Archibald Robertson, D.D., LL.D.), and in other churches and chapels in the city.

The Congress was received by The Right Worshipful The Mayor of Exeter.

The first General Meeting was held on July 7th. The Right Hon. Earl Fortescue, K.C.B. (Lord Lieutenant of Devonshire) was installed as President of the Congress, and delivered his Inaugural Address.

The business of the Congress was divided into four Sections and five Conferences; particulars of these were given in the Programme of the Congress in the Supplement of No. 5 of the Journal.

During the Congress sixty-one Addresses, Lectures, and Papers were read at the meetings; and excursions and visits of inspection were made to Woodbury Common; Hennock Waterworks; the City Waterworks at Pynes; by Steam Launch to Turf, Woodbury Castle Earthworks, and Marley; Mylor Waterworks at Teignmouth; Totnes; by Steamer down the Dart; Torquay; Dartmoor; and Princetown.

The members and delegates were most hospitably entertained at a Conversazione in the Royal Albert Memorial by The Right Worshipful The Mayor and Mayoress of Exeter; at Garden Parties by H. E. Duke, K.C., M.P., at "Maryfield," Exeter, The Lord Bishop of Exeter and Mrs. Robertson in the Palace Grounds, the Sheriff of Exeter and Mrs. Every in the Rougemont Grounds, Sir John and Lady Shelley at Shobrooke, Crediton, Sir Robert L. Newman at Mamhead, Mr. A. T. Loram at Rosamondford, Aylesbeare; and at the Excursions by Mrs. Brice, Mr. Atherton Byrom, the Exeter City Water Committee, the Teignmouth U.D.C., and the Torquay Town Council.

The numbers attending the Congress were as follows: Delegates, 477, representing 253 Authorities and learned institutions; Fellows, Members, and Associates of the Institute (not including those appointed Delegates), 233; Associates of the Congress, Ladies and others, 73; Complimentary and Press, 100—making a total of 883.

Reports of the work done in the different Sections and Conferences, and the resolutions passed, were read by the respective Secretaries, and the resolutions were referred to the Council of the Institute for consideration, and will be published, with a note of the action taken by the Council, in a subsequent issue of the Journal.

Votes of thanks were accorded to the Local Committee, and to those who had so hospitably received the members and delegates during the Congress.

The Exhibition was held in the Victoria Hall. There were 44 exhibitors, and the Judges awarded 10 Silver and 20 Bronze Medals.

Silver Medals.

W. & T. Avery, Ltd.,
Sanitary Automatic Weighing and Indicating Machines.

Beacon Light (Valveless) Gas Generator, Ltd., The,
The Beacon Light (Valveless) Petrol Gas Generator.

Exeter Corporation Electricity Department,
Hygienic Value of Electrical Appliances.

Exeter Gas Light & Coke Co.,
Gas Cooking and Heating Appliances.

Horlick's Malted Milk Co.,
Horlick's Malted Milk.

Rowe Bros. & Co., Ltd.,
Lead Pipes.

Slack & Brownlow,
Hospital Filter with Thermometer attached.

Southall Bros. & Barclay, Ltd.,
Compressed Sanitary Towels and Accouchement Outfits.

The Tintometer, Ltd.,
Lovibond's Tintometer Apparatus (including recent developments).

Virol, Ltd.,
Virol.

Bronze Medals.

The British Sanitary Co.,
Self-acting Earth Closet.

Broom, Reid & Harris,
Reid's Junketta Essence, Powder, and Tablets.

Candy & Co., Ltd.,
Devon Stoneware.

Hubber & Son,
"Aerogen" Petrol Gas Plant.

LYME REGIS CEMENT CO., LTD.,
Cement in various stages of Manufacture.

MITCHELL & SON,
Non-poisonous Paints.

MOULE'S PATENT EARTH CLOSET CO., LTD.,
Earth Closets with Chucker Action.

"RONUK," LTD.
Ronuk.

MARK ROWE & SONS,
Imperial Electric Vacuum Cleaner.

ROWE BROS. & CO., LTD.,
Brandon Lavatory Basin.

ROWE BROS. & CO., LTD.,
"Rougemont" Bath.

ROWE BROS. & CO., LTD.,
Bed Pan Cleanser.

ROYAL SOCIETY FOR THE PREVENTION OF CRUELTY TO ANIMALS,
Humane Slaughtering Implements.

EXORS. OF THE LATE WM. SHARRATT,
Formalide Sprayer.

SOPER & AYERS,
Non-poisonous Paints.

THE STOURBRIDGE GLAZED BRICK & FIRE CLAY CO., LTD.,
"Gravisede" Flushing System.

THE STOURBRIDGE GLAZED BRICK & FIRE CLAY CO., LTD.,
"Clyro" Closet with Swivel Outlet.

THE STOURBRIDGE GLAZED BRICK & FIRE CLAY CO., LTD.,
Stafford School W.C. with Inspection Cap.

THE TWO-FLUSH CISTERN CO., LTD.,
"Newland" Two-Flush Cistern.

THE WEBB LAMP CO., LTD.,
Galvo Chemical Fire Extincteur, for Transport.

Deferred for Further Consideration.

THE CANDY FILTER CO., LTD.,
De-Clor Filter.

E. O. HARDING.
Combined Oil, Vapour, and Air Drain-tester.

HEENAN & FROUDE,
Refuse Destructor, Trough Grate Clinkering.

EDWIN A. MANSFIELD & CO.,
Wireless Electric Pipe Locator.

GEORGE WALLER & SON,
Rotary Sprinkler, with Self-dosing Tank.

GEORGE WALLER & SON,
Briscoe's Alternating Arrangement for Contact Beds.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses have been held at:—

Cardiff, June 27th and 28th.

For Inspectors of Meat and other Foods.

Birmingham, July 18th and 19th.

At these Examinations 64 candidates presented themselves, and the following were awarded certificates:—

Women Health Visitors and School Nurses.

Kirby, Ethel May.
Middleton, Ruth.

Inspectors of Nuisances.

Humphreys, Reginald.
Noote, Percy Fred.
Pyatt, William George.
Rees, John.
Whone, Ernest.
Williams, Gwladys Helen.

Inspectors of Meat and other Foods.

Barker, Joseph Sydney.
Barnish, John.
Cullen, Fred Augustus Charles.
Dickin, Alfred.
Dunstan, Frank William.
Hoyte, Cunliffe Malcolm Gustave.
Hudson, William Arthur.
King, George Greig.
Lord, John Frederick.
Mortimer, Frederick William.
Shaw, Alfred Ernest.
Slatter, Charles.
Speake, Thomas.
Swift, Edmund.
Turner, Frank Stanley.

FORTHCOMING MEETINGS.

Students' Lectures.

The Fifty-fifth Course of Lectures and Demonstrations for Sanitary Officers will commence on Monday, September 15th.

A Course of Lectures on School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses, will commence on Monday, October 6th.

A Course of Practical Training for Meat Inspectors will commence on Friday, September 26th.

Congress and Exhibition, 1914.

The Council of The Royal Sanitary Institute have accepted an invitation from the Mayor and Corporation of Blackpool to hold the next Congress and Exhibition of the Institute in Blackpool, July 6–11th, 1914.

LIST OF MEMBERS AND ASSOCIATES

Elected July, 1913.

MEMBERS.

* Marked thus have passed the Examination of the Institute in Sanitary Science as applied to Buildings and Public Works.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

Reg. No.	Date of Election.	
3517	1913. July.	Aburrow, Charles, M.INST.C.E., 615, *Consolidated Buildings, Johannesburg, S. Africa.*
3518	1913. July.	Alford, Henry James, M.D., F.I.C., (*M.O.H.*), 19, *Park Street, Taunton.*
3480	1913. July.	Amarnath, B.SC.(ENG.)GLASG., 29, *Stanley Street, Glasgow, W.* (*Chunian, District Lahore, Punjab, India.*)
3507	1913. July.	*‡Ashbrook, Henry Alfred, 4, *W. O. Quarters, Whittington Barracks, Lichfield.*
3481	1913. July.	Barlow, Thomas William Naylor, M.R.C.S., L.R.C.P., D.P.H.CAMB., (*M.O.H.*), *Public Health Office, Egremont, Cheshire.*
3508	1913. July.	*Bendall, John Lionel, *Trowscoed Lodge, Leckhampton, Cheltenham.*
3482	1913. July.	Bose, Satya Bhusan, B.A., C.E., *Sanitary Department, Imperial Secretariat, Delhi, India.*
3483	1913. July.	Brown, Robert Huse, ASSOC.M.AM.SOC.C.E., 21, *West 127th Street, New York City, U.S.A.*
3484	1913. July.	Bygott, Albert Henry, M.D.LOND., D.P.H., (*M.O.H.*), 76, *Risbygate, Bury St. Edmunds, Suffolk.*
3485	1913. July.	Chalmers, Albert John, M.D., F.R.C.S.ENG., D.P.H., *The Wellcome Tropical Research Laboratories, Khartoum.*
3486	1913. July.	Coats, James Richardson, B.SC., ASSOC.M.INST.C.E., *City Engineer, Madras, India.*
3487	1913. July.	Coleman, Charles John, B.A., M.B., D.P.H., (*M.O.H.*), *Health Offices, Lincoln.*
3509	1913. July.	*Cranfield, Edward George Shaw, 55, *Palewell Park, East Sheen, S.W.*
3488	1913. July.	Date, William Horton, M.R.C.S., L.S.A., D.P.H., (*School M.O.*), 1, *Ashleigh Road, Barnstaple.*
3489	1913. July.	Davis, Arthur Henry, P.A.S.I., 31, *Upper Addison Gardens, Holland Park, W.*
3490	1913. July.	Dial, Wazir, B.SC.PUNJAB, *Assistant Engineer, Imperial Works, Delhi, India.*
3491	1913. July.	Gamlen, Harold Ernest, M.B., B.S., D.P.H., (*M.O.H.*), *Chadwick House, West Hartlepool.*
3510	1913. July.	*Gangulee, Jnanendra Nath, 41, *Mysore Road, Lavender Hill, Clapham Junction, S.W.*

3511 1913. July. *GREENWOOD, Frederick, 28, *Exeter Road, Ellesmere Port, near Chester.*

3492 1913. July. HAYHURST, James Rogerson, M.R.C.V.S., D.V.S.M.VICT., *Superintendent and Chief Veterinary Inspector, Metropolitan Cattle Market, Islington, N.*

3493 1913. July. JACK, Harry Robertson, c/o *W. Bridges & Co.*, 3, *Salter's Hall Court, Cannon Street, E.C.*

3516 1889. May. JAMES, Charles Alfred, L.R.C.P., M.R.C.S., D.P.H., *The Pollard Elms, Upper Clapton Road, N.E.*

3494 1913. July. LOMER, Theodore Adolf, B.A., M.D., C.M., D.P.H., (*M.O.H.*), *Medical Officer of Health, Ottawa, Canada.*

3512 1913. July. *M* MACONOCHIE-WELLWOOD, William Alexander Maximilian George, (*Capt., A.S.C.,*) *Army Service Corps, York.*

3495 1913. July. MAKEPEACE, W. H., *Borough Sewage Engineer, Leek Road, Stoke-on-Trent.*

3496 1913. July. MUMFORD, Ernest Moore, M.SC., 75, *High Street, C.-on-M., Manchester.*

3497 1913. July. NANKIVELL, Austin Threlfall, M.D., B.S.LOND., D.P.H., (*M.O.H.*), *Oakleigh, St. Austell, Cornwall.*

3519 1913. July. NEECH, James Thomas, M.D., L.R.C.P., D.P.H., (*M.O.H.*), "*Ashfield,*" *Savile Park, Halifax.*

3498 1913. July. ORFY, Abdel Rahman, 21, *Gordon Street, Gordon Square, W.C.* (*New Helmia, Cairo, Egypt.*)

3499 1913. July. RAFFLE, Andrew Banks, M.D., B.S., B.HY., D.P.H., LL.D., (*School M.O.*), *Shire Hall, Durham.*

3500 1913. July. REAN, William Henry, A.M.I.M.&C.E., 88, *Oxford Gardens, North Kensington, W.*

3501 1913. July. ROBERTS, John Hubert, P.A.S.I., 19, *Heathfield Street, Swansea.*

3502 1913. July. SMITH, James Irvine, M.R.C.V.S., J.P., *Director of Abattoirs, Johannesburg, Transvaal.*

3513 1913. July. *‡STEWART, Herbert, *Town Hall, Drummoyne, New South Wales.*

3503 1913. July. TYNDALE, Wentworth Francis, C.M.G., M.D.LOND., D.P.H., *Captain, R.A.M.C., Trevanion, Plympton, S. Devon.*

3504 1913. July. WALTERS, James Henry, M.I.M.&C.E., 46, *Moor Street, Congleton.*

3505 1913. July. WEBBER, Huart, LIC.R.I.B.A., 5, *New China Bazaar Street, Calcutta, India.*

3514 1913. July. *WHITSITT, Robert, 3, *Hartford Place, Armagh.*

3506 1913. July. WOODS, William J., M.B., B.CH., M.R.C.S., L.R.C.P. LOND., F.R.C.S.ENG., (*M.O.H.*), 191, *Chapel Street, Pietermaritzburg, Natal.* (*C/o Standard Bank of South Africa,* 10, *Clements Lane, Lombard Street, E.C.*)

3515 1913. July. *M* WRIGHT, Hubert Haward, *Lieut.*, A.S.C., *Kensington Barracks, London, W.*

ASSOCIATES.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.
V Marked thus have passed the Examination for Women Health Visitors and School Nurses.
S Marked thus have passed the Examination in School Hygiene, including Elementary Physiology.
M Marked thus have passed the Examination of the Institute for Inspectors of Meat and Other Foods.

Reg. No. Date of Election.

6251 1913. July. ‡Audsley, Percival Harold, 21, *Victoria Road, Dewsbury.*
6252 1913. July. ‡Bailey, Alfred Horace, 15a, *Old Elvet, Durham.*
6253 1913. July. ‡Bennett, William, 20, *Demesne Street, Stalybridge.*
6254 1913. July. ‡Brennan, Miss Sarah Ellen, *Oakdene, Church Road, New Mills, Derbyshire.*
6299 1909. April. ‡Brett, Charles Walton Thornton, 9, *Beaconsfield Arcade (Top Floor), Hong Kong.*
6255 1913. July. ‡Brosnan, Cornelius, *Acting Chief Sanitary Inspector, Broken Hill, New South Wales.*
6256 1913. July. ‡Burgess, George Daniel, 17, *Bourke Street, Sydney, New South Wales.*
6257 1913. July. ‡Burnup, John Adam, "*Burnbrae*," *Geelong Street, East Brisbane.*
6245 1913. July. Cantoni, Mario, 100, *Church Street, Chelsea, S.W.*
6258 1913. July. vChadwick, Miss Edith Caroline, *Lyndhurst, Dewsbury, Yorks.*
6259 1913. July. ‡Cochran, John, 30, *Arnold Street, Observatory, Cape Province.*
6260 1913. July. ‡Cunningham, Cecil H., *Town Clerk, Balranald, New South Wales.*
6261 1913. July. ‡Davies, John Henry, 19, *Manlove Street, Wolverhampton.*
6262 1913. July. vDavis, Miss Gertrude Nellie, *The Nursing Home, Stratford-on-Avon.*
6263 1913. July. ‡Day, Reginald, 37, *Regent Street, Mornington, Dunedin, N.Z.*
6264 1913. July. ‡Dean, Arnold, *Shire Hall, High Street, Preston, Victoria.*
6265 1913. July. sDunn, Miss Gladys May, *Lincluden, Ashton-in-Makerfield, Lancs.*
6266 1913. July. ‡Fishburn, Frank, 46, *Milton Street, Hull Road, York.*
6267 1913. July. vFlockton, Miss Alice Elizabeth, *Windy Nook, Larkfield, Rawdon, near Leeds.*
6268 1913. July. ‡Foster, Ernest, 56, *Stockdale Street, Kimberley, S. Africa.*
6269 1913. July. ‡Fowler, Hartley Harman, 86, *Wanderers' Avenue, Blakenhall, Wolverhampton.*
6301 1896. Jan. ‡Hanks, Louis, 32, *Gunnersbury Lane, Acton, W.*
6270 1913. July. ‡Henry, William, *R.E. Office, Alderney, Channel Islands.*
6271 1913. July. ‡Hoole, James George, *Seamer, near Scarborough.*
6249 1913. July. ‡Hughesdon, Miss Constance, *Governor's House, H.M. Prison, St. Alban's.*
6272 1913. July. vInston, Miss Emma, 167, *Carlton Road, Worksop, Notts.*

6273 1913. July. *s* Jay, Archibald, 5, *Avondale Place, Shaw Road, Bushbury, Wolverhampton.*
6274 1913. July. ‡Lewis, Thomas Oddian, *Bryncarn, Rhysiog Road, Abercarn, Mon.*
6275 1913. July. *v* Mackay, Miss Christina Helen, *Tighnaruadh, Cherryhinton Road, Cambridge.*
6276 1913. July. ‡Makin, Miss Miriam, *Rotunda Maternity Hospital, Rutland Square, Dublin.*
6277 1913. July. ‡Marshall, Alexander Ross, *Health Inspector, Broken Hill, New South Wales.*
6278 1913. July. ‡Marshall, John Carlyle, 15, *Victoria Parade, Collingwood, Melbourne, Victoria.*
6279 1913. July. *M* Miles, Albert George John, *Public Slaughter-houses, Pitlake, Croydon.*
6280 1913. July. ‡Millen, Rankin, 2, *Hamilton Place, Portrush, Co. Antrim.*
6281 1913. July. *v* Mills, Miss Mary E., *The Nursing Institute, Worcester.*
6282 1913. July. ‡Moorhouse, Edwin, 4a, *Cross Street, Whitehaven, Cumberland.*
3283 1913. July. ‡Newbould, Edwin, *High Street, Walsall Wood, Staffs.*
6284 1913. July. ‡Oldfield, W., 32, *Wood Street, Norton Malton, Yorks.*
6285 1913. July. ‡Peirce, William John Reuben, 40, *Sycamore Grove, East St. Kilda, Victoria, Australia.*
6300 1913. July. ‡Price, R. Lewis, *Surveyor and Sanitary Inspector, Dawley, Shropshire.*
6286 1913. July. *v* Rawlings, Miss Frances Kathleen, *The City Hospital, Fazakerley, Liverpool.*
6287 1913. July. ‡Richards, Richard Russell, 10, *High Street North, Dunstable, Beds.*
6288 1913. July. *v* Stocking, Miss Emily Charlotte, *Astley-St. Mary, near Shrewsbury.*
6289 1913. July. ‡Thomas, Robert William, "*Loma Lagi*," 37, *Hume Street, North Sydney, New South Wales.*
6290 1913. July. ‡Thorp, Miss Sarah Swallow, *Fern Villa, Vinery Road, Burley, Leeds.*
6291 1913. July. ‡Tucker, Arthur Edward, "*Merther*," *Belgrave Crescent, Torquay.*
6292 1913. July. *s* Tyreman, Miss Mary, 23, *Dorset Road, Harehills, Leeds.*
6250 1913. July. ‡Warwick, James Ernest James, *Box 139, Randfontein, Transvaal.*
6293 1913. July. *v* Webster, Katharine May, *Hagley Road, Stourbridge.*
6294 1913. July. ‡Welch, Charles Arthur, *Sefton Park, New South Wales.*
6295 1913. July. ‡Whiteley, Cyril, 69, *Oxford Street, Sheffield.*
6296 1913. July. *s* Wilkinson, Willy, 52, *Hall Lane, Armley, Leeds.*
6297 1913. July. ‡Wills, David Ebenezer, 73, *Robb Street, Georgetown, Demerara, British Guiana.*
6298 1913. July. ‡Wright, Percival William, *Wood Close Farm, Linton, near Burton-on-Trent.*

LIBRARY.

The Council are considering the possibility of extending to Members and Associates residing outside the London area the advantages of the comprehensive Library of the Institute. It is felt that owing to the numerous references made to the books by students and others, and to the fact that at present there are no duplicate copies of the books, it would not be possible to arrange for a full use of the Library; but as the Council are anxious to ascertain the use that would be made of the books by country members, they have made arrangements by which certain volumes can be obtained on loan. A list of these, together with the rules and form of application for the loan of the books, can be obtained on application to the Secretary.

Contributions and Additions, June and July, 1913.

**** For publications of Societies and Institutions, etc., see under "Academies."*

ACADEMIES (British).

Cremation Society of England. Transactions, No. XXXVI. 32 pp., 8vo. London, 1913. *The Society.*

Edinburgh. *Royal College of Physicians, Edinburgh.* Laboratory Report, Vol. XII. pp., 8vo. Edinburgh, 1913. *The College.*

Homes for Inebriates Association, 1912–1913. 20 pp., 8vo. London, 1913. *The Association.*

Institution of Water Engineers. Transactions, Vol. XVII. 278 pp., 8vo. London, 1913. *The Institution.*

London. *British Association for the Advancement of Science.* Report of the Eighty-second Meeting in Dundee, September 4th to 11th, 1912. 904 pp., 8vo. London, 1913. *The Association.*

——— *Institution of Mechanical Engineers.* Proceedings, October to December, 1912, and List of Members for 1913. 322 pp., 8vo. London, 1913. *The Institution.*

Midhurst. *King Edward VII. Sanatorium.* Sixth Annual Report, 1912. Price 1s. 95 pp., 8vo. Midhurst, 1912. *The Sanatorium.*

Queen Victoria's Jubilee Institute for Nurses. Twenty-third Annual Report. 69 pp., 8vo. London, 1913. *The Institute.*

York Health and Housing Reform Association. Twelfth Annual Report and Balance Sheet, 1912. 29 pp., 8vo. York, 1913. *The Association.*

ACADEMIES (Foreign).

American Institute of Architects. Year Book, 1913. 110 pp., 8vo. New York, 1913. *The Institute.*

Berne. *Bureau de Statistique.* Mariages, Naissances et Décès en Suisse de 1891 à 1900. Troisième Partie: Table de Mortalité, 1889–1900. 123 pp., 8vo. Berne, 1913. *The Bureau.*

——— *Bureau Fédéral des Assurances.* Rapport sur les Entreprises privées en Matière d'Assurances en Suisse en 1911. 196 pp. 8vo. Berne, 1913. *The Bureau.*

Philadelphia College of Physicians. Transactions, Third Series, Vol. 34. 444 pp., 8vo. Philadelphia, 1912. *The College.*

Binnie, *Sir Alexander R., M.Inst.C.E., F.G.S.* Rainfall, Reservoirs, and Water Supply. 157 pp., 8vo. London, 1913. *Messrs. Constable & Co., Ltd. (publishers).*

Board of Education. Regulations for Technical Schools, Schools of Art, and other forms of provision of Future Education in England and Wales. Part I.: Grant Regulations. 20 pp., 8vo. London, 1910. *The Board.*

Chalmers, *A. K., M.D.* The House as a Contributory Factor in the Death-rate. 27 pp., 8vo. London, 1913. *The Author.*

Christchurch (N.Z.) Drainage Board. Bye-Law No. 1, 1913. 23 pp., 8vo. Christchurch, 1913. *Edwin Cuthbert (Engineer to the Board).*

Christian, *M.* Disinfection and Disinfectants. 104 pp., 8vo. London, 1913. *Messrs. Scott, Greenwood & Son (Publishers).*

Crabtree, *John Henry.* A Guide for Students preparing for the Examination for an Appointment under the Factory and Workshops Act. 196 pp., 8vo. London, 1913. *Messrs. Eyre & Spottiswoode (publishers).*

Creaseley, *H. H.* A Campaign amongst the Doctors. 20 pp., 8vo. London, 1913. *W. Whitaker, F.R.S.*

Delépine, *S.* Milk-borne Tuberculosis, with Special Reference to Impending Legislation. 28 pp., 8vo. London, 1913. *The Author.*

England and Wales, Registrar-General. Census, 1911. Vol. VI.—Buildings of various kinds, Families or Separate Occupiers, and Population. 363 pp., 8vo. London, 1913. *Bernard Mallett (Registrar-General).*

Gloucestershire County Council. Twenty-fourth Annual Report of the Highways and General Purposes Committee. 12 pp., 8vo. Gloucester, 1913. *E. S. Sinnott.*

Herring-Shaw, *A., and* **Newsome,** *N. F. V.* Modern Sanitary Engineering and Plumbers Work. Vol. I. and II. 16 pp., fcap. London, 1913. *Longmans, Green and Co. (publishers).*

Lewes, *Prof. V. B., F.I.C., F.C.S.* Modern Research upon the Hygienic Principles relating to Lighting, Heating and Ventilation. 20 pp., 8vo. London, 1913. *W. Whitaker, F.R.S.*

Local Government Board. Dr. S. W. Wheaton's Report on Enteric Fever at Strood, in Rochester Borough, in 1912. New Series, No. 79. 11 pp., 8vo. London, 1913. *A. Newsholme, M.D., F.R.C.P.*

Mackenzie, *Wm., M.A., and* **Handford,** *P.* Model By-Laws, Rules, and Regulations under the Public Health and other Acts. 3 volumes. 975 pp., 8vo. London, 1899. *Purchased.*

MEDICAL OFFICERS OF HEALTH AND OTHER SANITARY REPORTS.

Aberdeen, *City of*, Mar. & April, 1913	*Matthew Hay, M.D.*
Bath, *Urban Sanitary Authority*, 1912	*W. H. Symons, M.D., D.P.H.*
Batley, 1912	*G. H. Pearce, L.R.C.P., L.R.C.S.*
Beckenham U.D.C., 1912	*J. M. Clements, M.D., D.P.H.*
Bentley-with-Arksey U.D.C., 1912 ..	*A. B. Dunne, M.B., D.P.H.*
Berkshire Education Committee, 1912 (School Medical Officer)	*G. C. Taylor, M.D., D.P.H.*
Birkenhead, C.B., 1912	*R. S. Marsden, M.B., D.P.H.*
Birmingham, *City of*, 1912 (Public Analyst)	*J. F. Liverseege, F.I.C., Ph.C.*
Birmingham Education Committee, 1912 (School Medical Officer) ..	*Geo. A. Auden, M.D., D.P.H.*
Blackburn C.B., 1912	*A. Greenwood, M.D., D.P.H.*
Bridlington R.D.C., 1912	*W. A. Wetwan, M.R.C.S.*
Bucklow R.D.C., and Knutsford, Winsford, and Biddulph U.D.C.'s, 1912	*T. W. H. Garstang, M.R.C.S., D.P.H.*
Cardiff, 1912; School Medical Officer, 1912	*Edw. Walford, M.D., D.P.H.*
Chepstow R.D.C., 1912	*T. L. Drapes, M.B., M.R.C.S., L.R.C.P.*
Cornwall C.C., April and May, 1913..	*Robert Burnet, M.D., D.P.H.*
Crewe, *Borough of*, 1912	*A. B. McMaster, M.S., D.P.H.*
Deptford, 1912	*W. H. Whitehouse, M.D., D.P.H.*
Ealing, 1912	*C. A. Patten, L.R.C.P., M.R.C.S.*
Eastbourne, 1912 (Meteorologist's Report)	*S. L. Henderson (Meteorologist).*
East Ham, 1912	*W. Benton, M.R.C.S., L.R.C.P., D.P.H.*
Eccles, 1912	*W. M. Hamilton, M.D., D.P.H.*
Edinburgh, 1912	*A. M. Williamson, M.D., B.Sc.*
Edinburgh, 1912, Sanitary Inspector..	*D. Rutherford.*
Enfield U.D.C., 1912	*W. P. Warren, L.R.C.P., L.R.C.S.*
Exeter, 1912	*E. A. Brash, L.R.C.P.*
Halifax C.B., School Medical Officer, 1912	*D. M. Taylor, M.D., D.P.H.*
Hampstead, 1912	*F. E. Scrase, F.R.C.S., L.R.C.P.*
Herefordshire C.C., 1912; School Medical Officer, 1912	*D. D. Gold, M.D., D.P.H.*
Ipswich C.B., 1912	*A. M. N. Pringle, M.B., D.P.H.*
Kent C.C. (Education Committee), 1912, School Medical Officer ..	*Wm. J. Howarth, M.D., D.P.H.*

Leith, *Burgh of*, 1912	*Wm. Robertson, M.D., D.P.H.*
Leyton U.D.C., 1912	*J. Francis Taylor, M.R.C.S., D.P.H.*
Lincoln, 1912	*C. J. Coleman, M.D., D.P.H.*
London, *City of*, Eight Weeks ending 12th April, 1913, and Five Weeks ending 17th May, 1913	*Wm. J. Howarth, M.D., D.P.H.*
Middlesbrough C.B., 1912	*Geo. Anderson (Chief Sanitary Inspector).*
New Zealand. Report on Public Health and Hospitals and Charitable Aid for 1911–12	*T. H. A. Valintine, M.R.C.S., L.R.C.P., D.P.H.*
Notts. C.C., 1912, School Medical Officer	*H. Handford, M.D., D.P.H.*
Oundle U.D.C., 1912 (M.O.H. and Surveyor)	*Geo. Belson Chilvers (Surveyor).*
Oxford, *City of*, 1912	*A. L. Ormerod, M.D., D.P.H.*
Richmond (Surrey), 1912, Medical Officer of Health and School Medical Officer	*J. H. Crocker, M.D., D.P.H.*
Shanghai, 1912	*A. Stanley, M.D., D.P.H.*
Swindon, 1912	*F. E. Streeten, D.P.H.*
Tasmania, 1911–1912	*J. S. Purdy, M.D., D.P.H.*
Victoria, Report upon the Education for 1911–12	*The Minister of Public Instruction.*
Wandsworth, 1912	*P. Caldwell Smith, M.D., D.P.H.*
Wednesbury, 1912	*W. C. Garman, M.D.*
West Riding Education Committee, 1912, School Medical Officer ..	*James R. Kaye, M.B., D.P.H.*
Wetherby R.D.C., 1912	*T. V. Gray (Inspector of Nuisances).*
Worcester, *City of*, 1912	*Mabyn Read, M.D., D.P.H.*

Patrick, *J. King, M.B., D.P.H.* Some Factors in the Fight with Tuberculosis. 24 pp., 8vo. London, 1913. *The Author.*

United States Public Health Service. Surgeon-General's Annual Report for 1912. 261 pp., 8vo. Washington, 1913. *Rupert Blue (Surgeon-General).*

Western Australia. Proceedings of Public Health Congress held at Perth from October 1st to 4th, 1912. *F. J. Huelin.*

Wilson, *H. Maclean, M.D., B.Sc., and* **Calvert,** *H. T., Ph.D., F.I.C.* A Text-book on Trade Waste Waters: their Nature and Disposal. 340 pp., 8vo. London, 1913. *Chas. Griffin & Co., Ltd. (publishers).*

GENERAL NOTES.

Sanitary Legislation.

The Parliamentary Committee of the Institute have had before them a number of Bills that have been introduced into Parliament during the present Session. Some of the Bills did not appear to call for any special action on the part of the Institute, but the Council have petitioned with regard to several Bills as mentioned below:—

Medical Officers of Health Superannuation. A Bill to provide for superannuation allowances to Medical Officers of Health employed by Local Authorities.

A petition was sent in favour of the Bill, on the ground that it would tend to the better administration of the Public Health Service if superannuation were provided for Public Health Officers.

Milk and Dairies. A Bill to make better provision with regard to the sale of milk and the regulation of dairies.

A petition was sent in favour of this Bill, and a communication was forwarded to the President of the Local Government Board with regard to one or two of the provisions of the Bill.

Mental Deficiency. A Bill to make further and better provision for the care of feeble-minded and other mentally defective persons, and to amend the Lunacy Acts.

A petition was sent in favour of the Bill.

Elementary Education (Defective and Epileptic Children). A Bill requiring Education Authorities to make provision for the education of mentally defective and epileptic children.

A petition was sent in favour of this Bill.

Deaths Registration and Burials. A Bill to amend the law relating to the registration of deaths and burials.

A petition was sent in favour of this Bill.

Milk and Dairies (Scotland). A Bill to ensure the purity of the milk supply and to regulate dairies in Scotland.

A petition was sent in favour of this Bill.

Vaccination Acts (Repeal). A Bill to repeal the Vaccination Acts.

A petition was sent against the Bill.

Smoke Abatement. A Bill for the prevention of nuisances caused by the improper emission of smoke.

Some suggestions for amendments to the Bill were forwarded to the supporters.

Daylight Saving. A Bill to promote the earlier use of daylight in certain months yearly.

A petition was sent in favour of the Bill.

Mental Deficiency and Lunacy (Scotland). A Bill to make further and better provision for the care of mentally defective persons, and to amend the law relating to lunacy in Scotland.

A petition was sent in favour of the Bill.

Fourth International Congress on School Hygiene.

This Congress is to be held at Buffalo, New York, U.S.A., from August 25th to August 30th, 1913.

The British Government is to be represented by Dr. R. H. Crowley, one of the Senior Assistant Medical Officers of the Board of Education, and Dr. James Kerr, Medical Research Officer of the London County Council, and one of the Honorary Secretaries of Organising Committee of Great Britain and Ireland will also attend. The Representatives of The Royal Sanitary Institute at the Congress will be Dr. James Kerr (London), Dr. H. M. Bracken (Minnesota State Board of Health), and Dr. J. J. Cronin (Manhattan).

Among the Sections specially arranged for Discussion are: The Hygiene of School Buildings, Grounds, Material, Equipment, and Upkeep; The Hygiene of School Administration, Curriculum, and Schedule; Medical, Hygienic, and Sanitary Supervision in Schools.

These Sections will be sub-divided, so that any question coming within the field of School Hygiene can be taken and discussed.

An Exhibition illustrating the practical or administrative phases of School Hygiene is being arranged; no charge is being made for space. Exhibits should be sent to Dr. Franklin C. Gran, Buffalo, New York, U.S.A.

Membership of the Congress is obtained by payment of $5·00, or one pound sterling. Application should be sent to the Secretary-General of the Congress, Dr. Thomas A. Storey, College of the City of New York, New York, U.S.A.

Congress and Exhibition, Lima, Peru.

In connection with the Fifth Latin American Medical Congress, an International Exposition of Hygiene will be opened in Lima, Peru, on November 2nd, 1913, and will last until December 31st, 1913.

Conference on Infant Mortality.

An English-speaking Conference on Infant Mortality, under the Presidency of The Right Hon. John Burns, will be held in the Caxton Hall, Westminster, on August 4th and 5th.

THE ROYAL SANITARY INSTITUTE.

MEETINGS HELD.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Women Health Visitors and School Nurses, in School Hygiene, including Elementary Physiology, and for Inspectors of Nuisances, have been held at—

London, July 25th and 26th.

At these Examinations 108 candidates presented themselves, and the following were awarded certificates:—

Sanitary Science as applied to Buildings and Public Works.

Brown, Robert.
Cowley, Herbert Reginald.
Jelley, Henry Francis.
McRae, Frederick Newberry.
Rochfort, Hume Guildford.

Women Health Visitors and School Nurses.

Alford, Florence Mary.
Brettell, Eva C.
Brown, Ethel Foster.
Carlton, Amy Elizabeth.
Clarke, Gwladys Elizabeth.
de Ridder, Edith Tilloch.
Foote, Robina.
Friend, Frances Rose.
Gibb, Mary Louisa Jane.
Harding, Alice.
Hughes, Elizabeth.
McCleary, Violet.
Milton, Ellen.
Pepper, Jane Maria Gooch.
Potter, Annie.
Stableforth, Beatrice Chastel.
Stanley, Florence Howard Wentworth.
Wolff, Nelly Amalia.

School Hygiene, including Elementary Physiology.

Cook, Gena.
Finger, Georgia Frances.
Huskinson, Henry John.
Kenny, Mary Frances.
Skelton, Ruth Filby.
Wicks, Lillian Ellen.

Inspectors of Nuisances.

Annear, Richard William.
Barwood, Bessie.
Chatelier, Margaret.
Cran, Alexander.
Crumpler, Constance Clara.
Duly, Richard William.
Goodman, Edward Harold.
Green, Alexander Tilbury.
Guy, Rupert Victor.
Hale, Herbert Spencer.
Harman, Stanley William.
Harris, Arthur.
Head, Eric Burton.
Kitchen, Bertha May.
Linington, Frank Arthur.
Macmillan, Sarah Mary.
McDougal, John.
Morris, Richard Palfrey.
Moss, George Fred.
Parsons, Ellen Annie.
Perrins, Ethel Elizabeth.
Rose-Innes, Arthur.
Saltwell, Emma Daisy.
Silversides, Kate Ellen.
Stanbrook, William George.
Thomas, Catherine Ellen.

FORTHCOMING MEETINGS.

SESSIONAL MEETINGS.

Newcastle-upon-Tyne, October 17th and 18th. Discussions on "Some Points in the relationship of Human to Bovine Tuberculosis," to be opened by Prof. H. J. Hutchens, D.S.O., Bacteriologist to the Corporation of Newcastle-upon-Tyne; and "Housing Problems in a Northern Industrial Town," to be opened by S. J. Clegg, M.B., Ch.B., D.P.H., Assistant Medical Officer of Health, and William Hudspeth, Chief Inspector of Nuisances, Newcastle-upon-Tyne.

Swansea, November 21st and 22nd. Discussion on "Open-air Education and Sanitation," to be opened by Thomas Evans, M.B., D.P.H., M.O.H. and School M.O., Swansea.

STUDENTS' LECTURES.

The Fifty-sixth Course of Lectures and Demonstrations for Sanitary Officers will commence on Monday, September 15th.

A Course of Lectures on School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses, will commence on Monday, October 6th.

A Course of Practical Training for Meat Inspectors will commence on Friday, September 26th.

A SHORT COURSE OF TRAINING LECTURES ON TUBERCULOSIS, suitable to the requirements of Women Sanitary Inspectors and Health Visitors, and to those whose duties include the visiting of phthisis cases, will be delivered by J. E. Squire, C.B., M.D., F.R.C.P., D.P.H., at the Institute, 90, Buckingham Palace Road, on Wednesdays in October, at 6 p.m.

1st. *The Spread of Tuberculosis.*—Sources of infection. Modes of entrance into the body (parts of infection). Changes in the tissues resulting from the activities of the tubercle bacillus. Toxamia. The various manifestations of tuberculosis in the body. Pulmonary tuberculosis (consumption, hip and spinal disease, etc., etc.).

8th. *Predisposition.*—Considerations in relation to the individual and his environment which favour infection. Diminished resistance. Personal habits. Overcrowding. Occupation. Heredity.

15th. *Preventive Measures.*—Notification. Segregation. General hygiene. A co-ordinated scheme. The value of personal instruction by health visitors.

22nd. *Treatment of the Tuberculous* in its bearing on prevention. Sanatorium treatment. Tuberculosis dispensaries. Provisions of the National Insurance Act.

The fee for the Course is 5s. Members and Associates of the Institute will be admitted without payment, but cannot introduce friends.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors Qualifying for Membership, for Inspectors of Nuisances, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses:—

Derby, October 10th and 11th.
Liverpool, October 24th and 25th.

For Inspectors of Meat and Other Foods:—

Leeds, October 17th and 18th.

Congress and Exhibition, 1914.

The Council of The Royal Sanitary Institute have accepted an invitation from the Mayor and Corporation of Blackpool to hold the next Congress and Exhibition of the Institute in Blackpool, July 6–11th, 1914.

Calendar for September and October, 1913.

As far as at present arranged.

SEPTEMBER.

15 M. Lecture to Sanitary Officers, at 7 p.m. Sanitary Law, A: Public Health Acts—English, Scotch, Irish; other Statutes relating to Public Health, by A. Wellesley Harris, M.R.C.S., D.P.H., M.O.H., Lewisham.

17 W. Lecture to Sanitary Officers, at 7 p.m. Sanitary Law, B: Public Health (London) Act, etc., by A. Wellesley Harris, M.R.C.S., D.P.H.

19 F. Lecture to Sanitary Officers, at 7 p.m. Sanitary Law, C: Factory and Workshop Acts; Smoke Legislation, Food and Drug Acts, 1899, by A. Wellesley Harris, M.R.C.S., D.P.H.

20 S. Inspection and Demonstration at the Wimbledon Sewage Works, at about 2.45 p.m. Conducted by C. H. Cooper, M.INST.C.E., Borough Engineer and Surveyor.

22 M. Lecture to Sanitary Officers, at 7 p.m. Duties of a Sanitary Inspector—General, A: Outdoor, by A. Wellesley Harris, M.R.C.S., D.P.H.

24 W. Demonstration of Book-keeping as carried out in a Sanitary Inspector's Office, at the Public Health Office, Town Hall, Upper St., Islington, N., at 6.30 p.m., by James R. Leggatt, Supt. Public Health Dept., Borough of Islington.

Lecture to Sanitary Officers, at 7 p.m. Duties of a Sanitary Inspector—General, B: Indoor, by A. Wellesley Harris, M.R.C.S., D.P.H.

26 F. Lecture—Meat Inspectors' Course, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M., Chief Veterinary Inspector and Supt. of Abattoirs, Metropolitan Cattle Market, Islington.

Lecture to Sanitary Officers, at 7 p.m. Duties of a Sanitary Inspector, C: Offensive Trades and Trade Nuisances, etc., by A. Wellesley Harris, M.R.C.S., D.P.H.

27 S. Inspection and Demonstration in the District of Chiswick, at 3 p.m. Conducted by J. H. Clarke, Chief Sanitary Inspector, Chiswick.

29 M. Lecture to Sanitary Officers, at 7 p.m. Infectious Diseases, by A. Greenwood, M.D., B.SC., D.P.H., M.O.H., Kent C.C.

OCTOBER.

1 W. Inspection and Demonstration in the District of Islington, at 2.30 p.m. (number limited). Conducted by James R. Leggatt.

Training Lecture on Tuberculosis, for Women Sanitary Inspectors and Health Visitors, and those whose duties include the visiting of Phthisis Cases, at 6 p.m. The spread of Tuberculosis, by J. E. Squire, C.B., M.D., F.R.C.P., D.P.H.

Lecture to Sanitary Officers, at 7 p.m. Methods of Disinfection, by A. Greenwood, M.D., B.SC., D.P.H.

3 F. Lecture—Meat Inspectors' Course, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.
Lecture to Sanitary Officers, at 7 p.m. Water: Composition, Pollution and Purification, by A. Greenwood, M.D., B.SC., D.P.H.

4 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.
Inspection and Demonstration at Bushey Sewage Works, at 3.30 p.m. Conducted by H. C. Adams, ASSOC.M.INST.C.E.

6 M. Lecture to Sanitary Officers, at 7 p.m. Elementary Statistics, by A. Greenwood, M.D., B.SC., D.P.H.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. General Structure and Functions of the Body, by G. Eric C. Pritchard, M.A., M.D.

7 Tu. Lecture to Sanitary Officers, at 7 p.m. Elementary Science: Physics, Chemistry, by Alan E. Munby, M.A., A.R.I.B.A.

8 W. Inspection and Demonstration in the District of Chiswick, at 3 p.m. (number limited). Conducted by J. H. Clarke.
Training Lecture on Tuberculosis, for Women Sanitary Inspectors and Health Visitors, and those whose duties include the visiting of Phthisis Cases, at 6 p.m. Predisposition, by J. E. Squire, C.B., M.D., F.R.C.P., D.P.H.
Lecture to Sanitary Officers, at 7 p.m. Elementary Science: Physics, Chemistry, by Alan E. Munby, M.A., A.R.I.B.A.

10 F. Lecture—Meat Inspectors' Course, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. Personal Hygiene, by Eric C. Pritchard, M.A., M.D.

10 F. }
11 S. } Examinations—Derby.

11 S. Inspection and Demonstration at the Lambeth Disinfecting Station, at 2.30 p.m. Conducted by J. Priestley, M.D., D.P.H., M.O.H., Lambeth.

13 M. Demonstration on Meteorological Instruments in the Parkes Museum, at 6 p.m., by the Director, E. White Wallis, F.S.S.
Lecture to Sanitary Officers, at 7 p.m. Elementary Science: Physics, Chemistry, by Alan E. Munby, M.A., A.R.I.B.A.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. The Growth and Development of the Child: Hygiene of the Special Senses, by G. Eric C. Pritchard, M.A., M.D.

15 W. Inspection and Demonstration in the District of Islington, at 2.30 p.m. (number limited). Conducted by James R. Leggatt.
Training Lecture on Tuberculosis, for Women Sanitary Inspectors and Health Visitors, and those whose duties include the visiting of Phthisis Cases, at 6 p.m. Preventive Measures, by J. E. Squire, C.B., M.D., F.R.C.P., D.P.H.
Lecture to Sanitary Officers, at 7 p.m. Elementary Science: Physics, Chemistry, by Alan E. Munby, M.A., A.R.I.B.A.

17 F. Lecture to Sanitary Officers, at 7 p.m. Building Materials, by Edward Willis, ASSOC.M.INST.C.E., F.S.I.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. Physical Development, by James Kerr, M.A., M.D., D.P.H.

17 F. }
18 S. } **Sessional Meeting,** NEWCASTLE-UPON-TYNE, at 7 p.m., in the Town Hall. Discussions on "Some points in the relationship of human to bovine Tuberculosis," opened by Prof. H. J. Hutchens, D.S.O., Bacteriologist to the Corporation of Newcastle-upon-Tyne, and "Housing Problems in a Northern Industrial Town," opened by S. J. Clegg, M.B., CH.B., D.P.H., Assistant M.O.H., and William Hudspeth, Chief Inspector of Nuisances, Newcastle-upon-Tyne.

17 F. }
18 S. } Examination for Inspectors of Meat and other Foods—Leeds.

18 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.
Inspection and Demonstration at the Express Dairy Company's College Farm, Finchley, at 3 p.m. Conducted by G. Titus Barham, Managing Director.

20 M. Lecture to Sanitary Officers, at 7 p.m. Ventilation, Warming, and Lighting, by A. Saxon Snell, F.R.I.B.A.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. Physical Conditions affecting Health in Schools: Recognition of Physical and Mental Defects, by James Kerr, M.A., M.D., D.P.H.

THE ROYAL SANITARY INSTITUTE.

FORTHCOMING MEETINGS.

Sessional Meetings.

Newcastle-upon-Tyne, October 17th at 7.30 p.m., Discussions on "Some Points in the relationship of Human to Bovine Tuberculosis," to be opened by Prof. H. J. Hutchens, D.S.O., M.A., M.R.C.S., D.P.H., Bacteriologist to the Corporation of Newcastle-upon-Tyne; and "Housing Problems in a Northern Industrial Town," to be opened by S. J. Clegg, M.B., Ch.B., D.P.H., Assistant Medical Officer of Health, and William Hudspeth, Chief Inspector of Nuisances, Newcastle-upon-Tyne.

On Saturday, October 18th, at 10 a.m., in the Town Hall, Demonstration of the new Electrolytic Treatment of Industrial Lead Poisoning, by Mr. T. Maltby Clage, Ph.C., followed by a visit to Messrs. Walker, Parker & Co.'s, Ltd., Lead Works, and a Survey of a Housing Reconstruction Scheme at Forthbanks.

The members will be entertained at Luncheon by the Sanitary Committee, after which visits will be made to places of local interest.

Manchester, October 24th.

Rochdale, October 25th. Visit to Rochdale Sewage Works, conducted by S. S. Platt, M.Inst.C.E., Borough Engineer.

Swansea, November 21st and 22nd. Discussion on "Open-air Education and Sanitation," to be opened by Thomas Evans, M.B., D.P.H., M.O.H. and School M.O., Swansea.

Students' Lectures.

A Course of Lectures on School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses, will commence on Monday, October 6th.

A Course of Practical Training for Meat Inspectors will commence on Friday, September 26th.

A Short Course of Training Lectures on Tuberculosis, suitable to the requirements of Women Sanitary Inspectors and Health Visitors, and to those whose duties include the visiting of phthisis cases, will be delivered by J. E. Squire, C.B., M.D., F.R.C.P., D.P.H., at the Institute, 90, Buckingham Palace Road, on Wednesdays in October, at 6 p.m.

1st. *The Spread of Tuberculosis.* 8th. *Predisposition.* 15th. *Preventive Measures.* 22nd. *Treatment of the Tuberculous* in its bearing on prevention.

The fee for the Course is 5s. Members and Associates of the Institute will be admitted without payment, but cannot introduce friends.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors Qualifying for Membership, for Inspectors of Nuisances, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses:—

Derby, October 10th and 11th.
Liverpool, October 24th and 25th.
Sheffield, November 7th and 8th.
Newcastle, November 14th and 15th.
Manchester, November 28th and 29th.

For Inspectors of Meat and Other Foods:—

Leeds, October 17th and 18th.
Bristol, October 31st and November 1st.

Congress and Exhibition, 1914.

The Council of The Royal Sanitary Institute have accepted an invitation from the Mayor and Corporation of Blackpool to hold the next Congress and Exhibition of the Institute in Blackpool, July 6–11th, 1914.

Calendar for October and November, 1913.

As far as at present arranged.

OCTOBER.

1 W. Inspection and Demonstration in the District of Islington, at 2.30 p.m. (number limited). Conducted by James R. Leggatt.
Training Lecture on Tuberculosis, for Women Sanitary Inspectors and Health Visitors, and those whose duties include the visiting of Phthisis Cases, at 6 p.m. The spread of Tuberculosis, by J. E. Squire, C.B., M.D., F.R.C.P., D.P.H.
Lecture to Sanitary Officers, at 7 p.m. Methods of Disinfection, by A. Greenwood, M.D., B.SC., D.P.H.

3 F. Lecture—Meat Inspectors' Course, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.
Lecture to Sanitary Officers, at 7 p.m. Water: Composition, Pollution and Purification, by A. Greenwood, M.D., B.SC., D.P.H.

4 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.
Inspection and Demonstration at Bushey Sewage Works, at 3.30 p.m. Conducted by H. C. Adams, ASSOC.M.INST.C.E.

6 M. Lecture to Sanitary Officers, at 7 p.m. Elementary Statistics, by A. Greenwood, M.D., B.SC., D.P.H.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. General Structure and Functions of the Body, by G. Eric C. Pritchard, M.A., M.D.

7 Tu. Lecture to Sanitary Officers, at 7 p.m. Elementary Science: Physics, Chemistry, by Alan E. Munby, M.A., A.R.I.B.A.

8 W. Inspection and Demonstration in the District of Chiswick, at 3 p.m. (number limited). Conducted by J. H. Clarke.
Training Lecture on Tuberculosis, for Women Sanitary Inspectors and Health Visitors, and those whose duties include the visiting of Phthisis Cases, at 6 p.m. Predisposition, by J. E. Squire, C.B., M.D., F.R.C.P., D.P.H.
Lecture to Sanitary Officers, at 7 p.m. Elementary Science: Physics, Chemistry, by Alan E. Munby, M.A., A.R.I.B.A.

10 F. Lecture—Meat Inspectors' Course, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.
Lecture on School Hygiene and for Health Visitors, at 7 p.m. Personal Hygiene, by Eric C. Pritchard, M.A., M.D.

10 F. }
11 S. } Examinations—Derby.

11 S. Inspection and Demonstration at the Lambeth Disinfecting Station, at 2.30 p.m. Conducted by J. Priestley, M.D., D.P.H., M.O.H., Lambeth.

13 M. Demonstration on Meteorological Instruments in the Parkes Museum, at 6 p.m., by the Director, E. White Wallis, F.S.S.

Lecture to Sanitary Officers, at 7 p.m. Elementary Science: Physics, Chemistry, by Alan E. Munby, M.A., A.R.I.B.A.

Lecture on School Hygiene and for Health Visitors, at 7 p.m. The Growth and Development of the Child: Hygiene of the Special Senses, by G. Eric C. Pritchard, M.A., M.D.

15 W. Inspection and Demonstration in the District of Islington, at 2.30 p.m. (number limited). Conducted by James R. Leggatt.

Training Lecture on Tuberculosis, for Women Sanitary Inspectors and Health Visitors, and those whose duties include the visiting of Phthisis Cases, at 6 p.m. Preventive Measures, by J. E. Squire, C.B., M.D., F.R.C.P., D.P.H.

Lecture to Sanitary Officers, at 7 p.m. Elementary Science: Physics, Chemistry, by Alan E. Munby, M.A., A.R.I.B.A.

17 F. Lecture to Sanitary Officers, at 7 p.m. Building Materials, by Edward Willis, ASSOC.M.INST.C.E., F.S.I.

Lecture on School Hygiene and for Health Visitors, at 7 p.m. Physical Development, by James Kerr, M.A., M.D., D.P.H.

17 F.
18 S. { **Sessional Meeting,** NEWCASTLE-UPON-TYNE, at 7 p.m., in the Town Hall. Discussions on "Some points in the relationship of human to bovine Tuberculosis," opened by Prof. H. J. Hutchens, D.S.O., Bacteriologist to the Corporation of Newcastle-upon-Tyne, and "Housing Problems in a Northern Industrial Town," opened by S. J. Clegg, M.B., CH.B., D.P.H., Assistant M.O.H., and William Hudspeth, Chief Inspector of Nuisances, Newcastle-upon-Tyne. On Saturday, October 18th, Demonstration of Electrolytic Treatment of Industrial Lead Poisoning, by Mr. T. Maltby Clage, PH.C., and Visit to Works.

17 F. }
18 S. } Examination for Inspectors of Meat and other Foods—Leeds.

18 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.

Inspection and Demonstration at the Express Dairy Company's College Farm, Finchley, at 3 p.m. Conducted by G. Titus Barham, Managing Director.

20 M. Lecture to Sanitary Officers, at 7 p.m. Ventilation, Warming, and Lighting, by A. Saxon Snell, F.R.I.B.A.

Lecture on School Hygiene and for Health Visitors, at 7 p.m. Physical Conditions affecting Health in Schools: Recognition of Physical and Mental Defects, by James Kerr, M.A., M.D., D.P.H.

22 W. Inspection and Demonstration at John Knight, Ltd., Soap Works, Silvertown, at 3 p.m.

Training Lecture on Tuberculosis, for Women Sanitary Inspectors and Health Visitors, and those whose duties include the visiting of Phthisis Cases, at 6 p.m. Treatment of the Tuberculous, by J. E. Squire, C.B., M.D., F.R.C.P., D.P.H.

Lecture to Sanitary Officers, at 7 p.m. Building Sites, Construction, and Sanitary Planning, by Edward Willis, ASSOC.M.INST.C.E., F.S.I.

24 F. Lecture—Meat Inspectors' Course, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.

Lecture to Sanitary Officers, at 7 p.m. Details of Plumbers' Work, by Walter Scott.

Lecture on School Hygiene and for Health Visitors, at 7 p.m. School Buildings and Dwellings, by J. Osborne Smith, F.R.I.B.A.

24 F. **Sessional Meeting,** MANCHESTER.

25 S. **Sessional Meeting,** ROCHDALE. Visit to Sewage Works. Conducted by S. S. Platt, M.INST.C.E., Borough Engineer.

24 F. }
25 S. } Examinations—Liverpool.

25 S. Inspection and Demonstration at the Sewage and Destructor Works, Ealing, at 2.15 p.m. Conducted by Charles Jones, M.INST.C.E., Borough Engineer and Surveyor.

25 S. Demonstration—School Hygiene and Health Visitors' Course, at a Secondary and Elementary School, by J. Osborne Smith, F.R.I.B.A.

27 M. Lecture to Sanitary Officers, at 7 p.m. Calculations, Measurements, and Plans and Sections, by W. C. Tyndale, M.INST.C.E.

Lecture on School Hygiene and for Health Visitors, at 7 p.m. Food and Clothing, by A. Beresford Kingsford, M.D., M.R.C.S., L.R.C.P., D.P.H.

29 W. Inspection and Demonstration at the L.C.C. Municipal Lodging House, Kemble Street, Drury Lane, W.C., at 3 p.m.

Lecture to Sanitary Officers, at 7 p.m. Sanitary Appliances, by J. Osborne Smith, F.R.I.B.A.

31 F. Demonstration on Fish Inspection—Meat Inspectors' Course, at 7 p.m., by Chas. Hattersley, Chief Fish Inspector, Fishmongers' Company.

Lecture to Sanitary Officers, at 7 p.m. House Drainage, by J. Osborne Smith, F.R.I.B.A.

Lecture on School Hygiene and for Health Visitors, at 7 p.m. Elements of Home Nursing, by Miss Const. Barker.

31 F. / 1 S. } Examination for Inspectors of Meat and other Foods—Bristol.

NOVEMBER.

1 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.

Inspection and Demonstration at the Richmond Water Works, at 3 p.m. Conducted by H. C. Adams, ASSOC.M.INST.C.E.

3 M. Lecture to Sanitary Officers, at 7 p.m. Sewerage, by Henry C. Adams, ASSOC.M.INST.C.E.

Lecture on School Hygiene and for Health Visitors, at 7 p.m. Care of Infants and Young Children, by Miss C. Barker.

5 W. Inspection and Demonstration in the District of Islington, at 2.30 p.m. (number limited). Conducted by James R. Leggatt, Superintendent, Public Health Department, Borough of Islington.

Lecture to Sanitary Officers, at 7 p.m. Sewage Disposal, by Henry C. Adams, ASSOC.M.INST.C.E.

7 F. Lecture—Meat Inspectors' Course, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.

Lecture to Sanitary Officers, at 7 p.m. Water Supply, by Henry C. Adams, ASSOC.M.INST.C.E.

Lecture on School Hygiene and for Health Visitors, at 7 p.m. Infant Feeding, by A. Beresford Kingsford, M.D., D.P.H.

7 F. / 8 S. } Examinations—Sheffield.

8 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.

10 M. Lecture to Sanitary Officers, at 7 p.m. Scavenging: Disposal of House Refuse, by Henry C. Adams, ASSOC.M.INST.C.E.

Lecture on School Hygiene and for Health Visitors, at 7 p.m. First Aid: Treatment of Injuries, Ailments, and Accidents, by A. Beresford Kingsford, M.D., D.P.H.

12 W. Lecture to Sanitary Officers, at 7 p.m. Signs of Health and Disease in Animals destined for Food, when Alive and after Slaughter, by W. Hunting, F.R.C.V.S.

13 Th. Inspection and Demonstration at the Metropolitan Cattle Market, York Road, N., at 2 p.m.

14 F. Lecture to Sanitary Officers, at 7 p.m. Names and Situations of the Organs of the Body in Animals, by W. Hunting, F.R.C.V.S.

Lecture on School Hygiene and for Health Visitors, at 7 p.m. Prevention of Communicable Disease, by E. H. T. Nash, M.R.C.S., L.R.C.P., D.P.H.

14 F. / 15 S. } Examinations—Newcastle.

15 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.

21 F. / 22 S. } **Sessional Meeting**, SWANSEA. Discussion on "Open-Air Education and Sanitation," to be opened by Thomas Evans, M.B., D.P.H., M.O.H., and School M.O., Swansea.

THE ROYAL SANITARY INSTITUTE.

REVIEWS OF BOOKS.

Disinfection and Disinfectants.*

This little volume, which claims to be a survey of our present knowledge of disinfection and disinfectants, serves as an elementary text-book on the subject, but scarcely does justice to the progress that has been made both at home and abroad since the time of Robert Koch.

The opening chapters deal with physical methods of disinfection, the process of steam heating being thoroughly discussed; it is to be regretted that hardly any mention is made of the germicidal powers of ultra-violet light, a method of disinfection ever growing in importance.

With regard to the testing of disinfectants, a subject that has lately attracted considerable attention, the first original thread method of Koch is dealt with; there is, however, no mention of any of the more recent work on this subject, such as the garnet method of Krönig and Paul, the carbolic acid coefficient test of Rideal and Walker with its various modifications, the *Lancet* test, Chick and Martin, Anderson and McClintic, and many others that have been suggested from time to time for the standard valuation of disinfectants. Chemical methods of disinfection include a short account of the oligodynamic action of certain metals, such as copper, and the germicidal powers of acids and bases, metallic salts, alcohols, and phenols. The statement that carbolic acid is "uninfluenced by the presence of salts, acids, alkalis . . . " requires correction.

The book concludes with a detailed account of the practical methods of sterilisation by means of formaldehyde and formalin vapour. S. R.

Report on the Application of Ozone to Water Purification.†

Mr. Spaulding's official title implies that the authorities consider this subject of great importance, and it is treated as a method quite feasible commercially. He is, indeed, strongly in favour of it as preferable to ordinary filtration, which may be efficient, but is "more or less cumbrous and expensive and not always practical," or to rapid filtration from dirt and treatment of the water with chemicals, "of which the most promising is chloride of lime." Failures at the Ozone installations at Lindsay, Ontario, and Ann Arbor, Michigan, are attributed to faulty construction and imperfect mixing of the liquid and gas. In the cases here discussed "emulsifiers" have led to success. A table is given of European plants with commencement dates and outputs; they number 26 in France, 4 in Roumania, 7 in Germany, 5 in Italy, 3 in Russia, 1 in Spain, and

* Disinfection and Disinfectants, by Prof. M. Christian, Royal Institute for Infectious Diseases, Berlin. Translated by Charles Salter. 8vo. 107 pp. Scott, Greenwood, & Sons, London, 1913. Price 5s.

† Report on the Application of Ozone to Water Purification, by Russell Spaulding, Consulting Ozone Engineer, New York State Department of Health. 4to. 40-45 pp., Illustrated. March, 1913.

3 in South America, with a joint daily capacity of 84·3 million gallons. The largest, that of St. Maur, Paris (treating a million gallons of river water per hour), is fully described with illustrations and statistics. Interesting descriptions are also given of the installations at Villefrance, near Nice, supplying ten towns of the Riviera; and of those at Paderborn and St. Petersburg. The reports of Dr. Bonjean and others show that after treatment no coli or pathogenic bacteria can be detected in 100 cc. The physical improvement is very great, without change in the soluble mineral constituents. Finally Mr. Spaulding considers that the latest developments have brought the method well within the boundaries of economical municipal administration, while "there is no means more reliable or absolute with which to overcome pollution and protect the public health." It is noted (p. 44) that in preparing ozone the non-production of heat should be sought rather than its elimination by cooling means, and the statement is made that an ideal generator is on its way to publicity. S. R.

Home Health and Domestic Hygiene.*

This manual has been written for those attending Home Health and Hygiene classes. The subject has been dealt with in eleven short chapters, very concisely and in very simple language, and questions are set for the student to work out.

In such a manual there is no scope for detailed treatment of any item; but in order to impress the need for ventilation it is not necessary to infer that the respiratory carbonic acid present in occupied rooms is capable, *per se*, of being a danger to health; nor is it sufficient to state that the Pasteur-Chamberland filter "requires cleansing from time to time to keep it in good working order." But the small book as a whole is an admirable statement to meet the end in view. One is pleased to see that the artificial values claimed for some disinfectants are ignored in the dilutions recommended in practice; and equally sound is the statement that "since the causes of consumption are to be sought in the dwellings and habits of the people, prevention of this disease cannot be left entirely to doctors; the public must help in the work; and the more widely the knowledge of the requirements for healthy life is disseminated, the more quickly may we hope to see the high death-rate from consumption diminish. The healthy person leading a healthy life and following out the common laws of health has nothing to fear from consumption." H. R. K.

Infant Care and Management.†

This is a thoroughly reliable little book, written in simple language by one who is practically acquainted with the homes of working-class mothers. The advice given is thoroughly sound and practical, and the methods suggested are well within the reach of those to whom the book is addressed.

The scope of the work is well adapted to the requirements of school teachers and lecturers in training colleges, and there can be no doubt that if the elder girls can be thoroughly imbued with the teachings of this little manual a great step forward will be taken in the management of the home and the upbringing of a healthy race. L. C. P.

---

* Home Health and Domestic Hygiene, by Sir John Collie, M.D., C.M., and C. F. Wightman, F.R.C.S. 189 pp., 8vo. Illustrated. George Gill and Sons, Ltd. London, 1913. Price 9d.

† Infant Care and Management: A Manual for Teachers, by Edith L. Maynard. 8vo. 113 pp. E. J. Arnold & Son, Ltd. 1913.

Aids to Public Health.*

This little book deals with water, sewage, soil, air, foodstuffs, antiseptics, and disinfectants, and will be found very useful by students in public health laboratories in enabling them to understand the various processes concerned in the practical examination and analysis of these substances in the laboratory. The book is replete with information on the various topics discussed, and is well up to date in all the latest scientific researches, so that it should form an invaluable *vade mecum* to the public health student. L. C. P.

MEETINGS HELD.

Sessional Meetings.

Newcastle-upon-Tyne. The meeting was held in the Town Hall on Friday, October 17th, at 7.30 p.m. The members were received by the Right Worshipful the Lord Mayor and the Chairman of the Sanitary Committee, Ald. Sir Henry Newton, J.P. Discussions took place on "Some Points in the Relationship of Human to Bovine Tuberculosis," opened by Prof. H. J. Hutchens, D.S.O., M.A., M.R.C.S., D.P.H., Bacteriologist to the Corporation of Newcastle-upon-Tyne, and "Housing Problems in a Northern Industrial Town," opened by S. J. Clegg, M.B., Ch.B., D.P.H., Assistant Medical Officer of Health, and William Hudspeth, Chief Inspector of Nuisances, Newcastle. Dr. Philip Boobbyer in the chair.

On Saturday, October 11th, a demonstration of the new Electrolytic Treatment of Industrial Lead Poisoning was given in the Town Hall by Mr. T. Maltby Clague, Ph.C., followed by a visit to Messrs. Walker, Parker & Co.'s Ltd., Lead Works. The members were entertained to Luncheon by the Sanitary Committee, and in the afternoon visited a Housing Reconstruction Scheme at Forthbanks, and the Walkerville Garden Suburb.

Manchester. The meeting was held in the Municipal School of Technology on Friday, October 24th, at 7 p.m. Discussions took place on "The Mechanical Filtration of Water Supplies and the Plumbo-solvent Action of Water," opened by Prof. A. Sheridan Delépine, M.D., C.M., B.Sc., and "The Working of the Shops Acts," opened by F. J. Rowe, Sanitary Department, Manchester. Mr. H. D. Searles-Wood, F.R.I.B.A., in theChair.

Rochdale, Saturday, October 25th. The Members were received in the Town Hall by the Worshipful the Mayor and the Chairman of the Sewage Works Committee at 2.30 p.m., and Mr. S. S. Platt, M.Inst.C.E., the Borough Engineer, gave a description of the new Sewage Works Extension, drawings of which were on view. Visits were then made to the Sewage Works, and after the inspection the Members were entertained to tea by the Sewage Works Committee.

---

* Aids to Public Health, by David Sommerville, B.A., M.D., D.P.H. 8vo. 146 pp. Baillière, Tindall, and Cox, London. 1913. Price 2s. 6d.

EXAMINATIONS.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses have been held at:—

Derby, October 10th and 11th.
Liverpool, October 24th and 25th.

For Inspectors of Meat and Other Foods:—

Leeds, October 17th and 18th.

At these Examinations 91 candidates presented themselves, and the following were awarded certificates:—

Sanitary Science as applied to Buildings and Public Works.

COWEN, HERBERT STEWART, *Douglas*.
HOLMES, HERBERT GEORGE MAXWELL, *Chatham*.
MACHIN, CYRIL BRUCE, *King's Heath*.

Women Health Visitors and School Nurses.

BINGLE, ALICE, *Lincoln*.
CRESWELL, KATY, *Loughborough*.
EDGELLER, CLARE, *Arnold*.
GOBERT, MARGARET JANE, *Tylorstown*.
HAYDEN, ALICE ELIZABETH, *Hartlepool*.
SHERLOCK, MARY E., *Liverpool*.

School Hygiene, including Elementary Physiology.

WILLATT, EVELYN, *Biddulph*.

Inspectors of Nuisances.

ARNOTT, HUGH, *Leith*.
BROWN, THOMAS OSWALD, *Edinburgh*.
EDWARDS, JAMES, *Liverpool*.
HARROLD, WILLIAM ALFRED, *Wolverhampton*.
HEMMING, ERNEST CHARLES, *Wolverhampton*.
HINES, THOMAS, *Leicester*.
HOLLOWAY, REBA HELEN, *Nottingham*.
HURST, DOUGLAS, *Burslem*.
LYNAM, WILLIAM ARTHUR TATTON, *Ripley*.
MITCHELL, JOHN EDWIN, *Hedon*.
MUSGRAVE, ANNIE MAUD, *Burton Joyce*.
OGDEN, HAROLD THOMAS, *Derby*.
PEACH, ARTHUR FRANCIS, *Derby*.
PRESTON, NORMAN D., *Burnley*.
ROWLAND, ARTHUR THOMAS, *Burton-on-Trent*.
SCHUN, EMMA LOUISE, *Liscard*.
STEBBINGS, DORA LILIAN, *Sherwood*.
STEVENSON, DOUGLAS HOWARD, *New Sawley*.
STEVENTON, PERCY CLARENCE, *Wolverhampton*.
THURMAN, JOHN W., *Oxford*.
WHITBREAD, WINIFRED HANNAH ETHEL, *Carlton*.

Inspectors of Meat and other Foods.

ARNOLD, FRANCIS, *Otley*.
BALMFORTH, JAMES ARTHUR SHAW, *Leeds*.
BEAUMONT, JOHN WILLIAM, *York*.
FISHBURN, FRANK, *York*.
HETHERINGTON, STEPHEN LACKENBY, *Blaydon*.
PARKIN, CHARLES EDWARD, *Rotherham*.
RICHARDSON, ERNEST, *York*.
STANDISH, ERNEST, *Headingley*.
STRAWBRIDGE, FREDERICK, *Leeds*.
WARRINGTON, TOM, *Leeds*.

FORTHCOMING MEETINGS.

Sessional Meetings.

Swansea, Friday, November 21st, at 6.30 p.m., in the Free Library. Discussion on "Open-air Education and Sanitation," to be opened by Thomas Evans, M.B., D.P.H., M.O.H. and School M.O., Swansea, followed by a short description of the Swansea Corporation Town Planning Scheme, by Mr. George Bell, A.M.Inst.C.E., the Borough Surveyor.

On Saturday, November 22nd, visits will be made to Schools, Clinics, Town Hill, the Garden Suburbs, and Public Buildings. The members will be entertained to Luncheon by the Health Committee.

London, Tuesday, December 9th, at 7.30 p.m. Discussion on "The Progress of School Hygiene," to be introduced by a Report of the Fourth International Congress on School Hygiene at Buffalo, by James Kerr, M.A., M.D., D.P.H., Medical Research Officer, London County Council.

Congress and Exhibition, 1914.

The Right Hon. the Earl Derby, G.C.V.O., P.C., D.L., has consented to act as President of the Twenty-ninth Congress and Exhibition of the Institute, to be held at Blackpool by invitation of the Corporation from July 6th to 11th, 1914.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors Qualifying for Membership, for Inspectors of Nuisances, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses:—

Sheffield, November 7th and 8th.
Newcastle, November 14th and 15th.
Manchester, November 28th and 29th.
London, December 5th and 6th.

For Smoke Inspectors:—

Manchester, November 28th and 29th.
London, December 5th and 6th.

For Inspectors of Meat and Other Foods:—

London, December 12th and 13th.

For Inspectors of Nuisances:—

Adelaide, South Australia, December, 1913.

CALENDAR FOR NOVEMBER AND DECEMBER, 1913.

As far as at present arranged.

NOVEMBER.

1 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.

Inspection and Demonstration at the Richmond Water Works, at 3 p.m. Conducted by H. C. Adams, ASSOC.M.INST.C.E.

3 M. Lecture to Sanitary Officers, at 7 p.m. Sewerage, by Henry C. Adams, ASSOC.M.INST.C.E.

Lecture on School Hygiene and for Health Visitors, at 7 p.m. Care of Infants and Young Children, by Miss C. Barker.

5 W. Inspection and Demonstration in the District of Islington, at 2.30 p.m. (number limited). Conducted by James R. Leggatt, Superintendent, Public Health Department, Borough of Islington.

Lecture to Sanitary Officers, at 7 p.m. Sewage Disposal, by Henry C. Adams, ASSOC.M.INST.C.E.

7 F. Lecture—Meat Inspectors' Course, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.

Lecture to Sanitary Officers, at 7 p.m. Water Supply, by Henry C. Adams, ASSOC.M.INST.C.E.

Lecture on School Hygiene and for Health Visitors, at 8 p.m. Infant Feeding, by A. Beresford Kingsford, M.D., D.P.H.

7 F. }
8 S. } Examinations—Sheffield.

8 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.

10 M. Lecture to Sanitary Officers, at 7 p.m. Scavenging: Disposal of House Refuse, by Henry C. Adams, ASSOC.M.INST.C.E.

Lecture on School Hygiene and for Health Visitors, at 8 p.m. First Aid: Treatment of Injuries, Ailments, and Accidents, by A. Beresford Kingsford, M.D., D.P.H.

12 W. Lecture to Sanitary Officers, at 7 p.m. Signs of Health and Disease in Animals destined for Food, when Alive and after Slaughter, by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.

13 Th. Inspection and Demonstration at the Metropolitan Cattle Market, York Road, N., at 2 p.m.

14 F. Lecture to Sanitary Officers, at 7 p.m. Names and Situations of the Organs of the Body in Animals, by J. R. Hayhurst, M.R.C.S., D.V.S.M.

Lecture on School Hygiene and for Health Visitors, at 7 p.m. Prevention of Communicable Disease, by E. H. T. Nash, M.R.C.S., L.R.C.P., D.P.H.

14 F. }
15 S. } Examinations—Newcastle-upon-Tyne.

15 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.

17 M. Lecture to Sanitary Officers, at 7 p.m. Practical Methods of Stalling and Slaughtering Animals, by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.

Lecture on School Hygiene and for Health Visitors, at 7 p.m. Methods of Teaching Hygiene, by Miss Constance Barker.

19 W. Inspection and Demonstration at Harrison Barber & Co.'s, Knackers' Yard, at 3 p.m. Conducted by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.

Lecture to Sanitary Officers, at 7 p.m. Diseased Meat, with a Demonstration of Morbid Specimens collected from Meat Markets, by James A. Dixon, M.R.C.V.S.

21 F. Lecture to Sanitary Officers, at 7 p.m. The Appearance and Character of Fresh Meat, etc., by A. R. Littlejohn, M.R.C.S., D.P.H., M.R.C.V.S.

21 F. }
22 S. } **Sessional Meeting**, SWANSEA, at the Free Library at 6.30 p.m. Discussion on "Open-Air Education and Sanitation," to be opened by Thomas Evans, M.B., D.P.H., M.O.H., and School M.O., Swansea. On Saturday, November 22nd, visits will be made to Schools, Clinics, Town Hill, Garden Suburbs, and Public Buildings. The members will be entertained to Luncheon by the Health Committee,

22 S. Demonstration—Meat Inspectors' Course, at 1.30 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.

24 M. Lecture to Sanitary Officers, at 7 p.m. Hygiene of Byres, by A. R. Littlejohn, M.R.C.S., D.P.H., M.R.C.V.S.

26 W. Lecture to Sanitary Officers, at 7 p.m. The Laws, By-Laws and Regulations, affecting the Inspection and the Sale of Meat and Other Articles of Food, by A. R. Littlejohn, M.R.C.S., D.P.H., M.R.C.V.S.

28 F. Lecture—Meat Inspectors' Course, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.

28 F. }
29 S. } Examinations—Manchester.

DECEMBER.

5 F. Lecture—Meat Inspectors' Course, at 7 p.m., by J. R. Hayhurst, M.R.C.V.S., D.V.S.M.

5 F. }
6 S. } Examinations—London.

9 Tu. **Sessional Meeting**, London, at 7.30 p.m. Discussion on "The Progress of School Hygiene," to be introduced by a Report of the Fourth International Congress on School Hygiene at Buffalo, by James Kerr, M.A., M.D., D.P.H., Medical Research Officer, London County Council.

12 F. }
13 S. } Examination for Inspectors of Meat and other Foods—London.

LIST OF MEMBERS AND ASSOCIATES

Elected October, 1913.

MEMBERS.

* Marked thus have passed the Examination of the Institute in Sanitary Science as applied to Buildings and Public Works.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

M Marked thus have passed the Examination of the Institute for Inspectors of Meat and Other Foods.

Reg. No.	Date of Election.	
3520	1913. Oct.	Abdulali, Tahirali, L.C.E.(BOMB.UNIV.), *Advising Engineer, Matheran Municipality, Matheran, Bombay Presidency, India.*
3521	1913. Oct.	Balfour, Andrew, M.D., B.SC.EDIN., D.P.H.CAMB., *Woodcote Churt, Farnham, Surrey.*
3522	1913. Oct.	Brash, Edward Alex., L.R.C.P.LOND., M.R.C.S.ENG., (*M.O.H.*). 35, *Southernhay West, Exeter.*
3550	1913. Oct.	*Brown, Robert, 59, *Harrison Road, Edinburgh.*
3523	1913. Oct.	Buckham, Thomas, M.B., B.S., (*M.O.H.*), *Linden Lodge, Lanchester, Co. Durham.*
3524	1913. Oct.	Burra, Launcelot Toke, M.B., B.CH.OXON., M.R.C.S., L.R.C.P., *Glebe House. Little Kimble, Butler's Cross, Buckingham.*
3551	1913. Oct.	*‡Cato, Clarence Murrell, *Sidney House, Toowong, Queensland.*
3525	1913. Oct.	Chandhey, Ran Vir Singh, M.A., B.SC.(ENG.)EDIN., *Mukerian, Hoshiarpur District, Punjab, India.*
3526	1913. Oct.	Clark, Robert Veitch, M.A., M.B., B.SC.EDIN., D.P.H., (*M.O.H.*), *Public Health Department, Town Hall, Croydon.*

3552 1913. Oct. *Cowley, Herbert Reginald, 26, *High Street, Southend-on-Sea.*

3527 1913. Oct. Delmege, James Anthony, M.R.C.S.ENG., L.R.C.P., D.P.H.LOND., 33, *Westcombe Park Road, Blackheath, S.E.*

3528 1913. Oct. Dube, Hari Shankar, L.M.S., D.P.H.LOND., *c/o K. C. Dube, Medical Officer of Health, Benares, India.*

3529 1913. Oct. Francis, Thomas Evans, D.P.H.LOND., (*M.O.H.*), *Town Hall, Llanelly, Carmarthenshire.*

3530 1913. Oct. Goulden, Herbert Edward, M.D.DURH., D.P.H.CAMB., *(School M.O.), The Elms, Clevelands, Exeter.*

3531 1913. Oct. Holding, Ralph Emerson, *Engineer's Department, Town Hall, Wood Green, N.*

3532 1913. Oct. Husain, Qazi Zahur, B.SC.ENG., B.A., 11, *Craven Terrace, Lancaster Gate, W. (Tanel, District Amritsar, Punjab, India.)*

3553 1913. Oct. *Jelley, Henry Francis, *Royal Engineer's Office, Chichester.*

3533 1913. Oct. Jull, Robert Charles, F.S.I., 1, *Cumberland Gardens, Tunbridge Wells, Kent.*

3534 1913. Oct. Khan, Ghulam Mohammed, B.SC.(ENG.)EDIN, 11, *George Square, Edinburgh.*

3535 1913. Oct. Lambie, John, M.D., D.P.H., (*M.O.H.*), 21, *Park Avenue, Mansfield, Notts.*

3536 1913. Oct. Litteljohn, Arthur Rienssett, M.R.C.S., L.R.C.P., M.R.C.V.S., D.P.H., *Local Government Board, Whitehall, S.W.*

3537 1913. Oct. MacIlraith, Alexander Robb MacIntyre, L.R.C.P., L.R.C.S.EDIN., D.P.H., *Holly House, Rawtenstall.*

3538 1913. Oct. McNaughton, Stewart, M.B., D.T.M. & H.EDIN., D.P.H.CAMB., 51, *North Bridge Street, Sunderland.*

3554 1913. Oct. *‡McRae, Frederick Newberry, *Borough Surveyor's Office, Saffron Walden.*

3539 1913. Oct. Maynard, Frank Henry, *Resident Engineer in charge of Gaya Waterworks and Drainage Scheme, Gaya, India.*

3540 1913. Oct. Modi, Nagindas Jakisondas, L.C.E.(BOMB. UNIV.), *Divisional Officer in the Bombay Improvement Trust*, 16, *Trebovir Road, Earl's Court, S.W.*

3541 1913. Oct. Nanda, Kanhya Lal, B.A.(PUNJAB UNIV.), 48, *Linden Gardens, Chiswick, W.*

3542 1913. Oct. Rai, Balwant, D.P.H.LOND., L.M.S.PUNJAB, *c/o Messrs. Thomas Cook & Sons, Ludgate Circus, E.C.*

3543 1913. Oct. Ram, Shobha, M.B., B.A., D.P.H.LOND., *Bulanala, Benares City, U.P., India.*

3553 1913. Oct. *ROCHFORT, Hume Guildford, 44, *Palace Square, Upper Norwood, S.E.*

3514 1913. Oct. ROY, Satish Chandra, L.M.S.(PUNJAB UNIV.), *Health Officer, Nagpur, Central Provinces, India.*

3515 1913. Oct. SAUNDERS, Martin Luther, F.S.I., A.R.I.B.A., 4, *Coleman Street, E.C.*

3516 1913. Oct. SAYRES, Alexander Ward Fortescue, M.D., M.R.C.S., L.R.C.P., D.P.H., *Fern Bank, Hartley, Plymouth.*

3517 1913. Oct. STIRK, Percy Herbert, M.R.C.S., L.R.C.P., D.P.H., *(School M.O.)*, 39, *Southernhay West, Exeter.*

3518 1913. Oct. STOCKS, Reginald Woolsey, L.R.C.P., M.R.C.S., D.P.H., *(M.O.H.), Health Department, West Bromwich.*

3519 1913. Oct. ‡*M* TUSTIN, Percy Brook, *Chief of Food and Dairy Division, City Hall, Winnipeg, Canada.*

3556 1913. Oct. WRAY, George Bury, M.R.C.S.ENG., D.P.H.LOND., *(M.O.H.)*, 115, *Waterloo Crescent, Nottingham.*

ASSOCIATES.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.
V Marked thus have passed the Examination for Women Health Visitors and School Nurses.
S Marked thus have passed the Examination in School Hygiene, including Elementary Physiology.
M Marked thus have passed the Examination of the Institute for Inspectors of Meat and Other Foods.

Reg. No. Date of Election.

6305 1913. Oct. V ALFORD, Miss Florence Mary, 60–64, *Lambeth Road, S.E.*

6306 1913. Oct. V ANDERSON, Miss May Christina, *The Colonial Hospital, Suva, Fiji.*

6307 1913. Oct. ‡BARWOOD, Miss Bessie, *The High House, Ludham, Norfolk.*

6302 1913 Oct. BRACKEN, James William, 142, *Halifax Road, Rochdale, Lancs.*

6308 1913. Oct. V BRETTELL, Miss Eva C., *Sibford Friends' School, near Banbury, Oxon.*

6309 1913. Oct. V BROWN, Miss Ethel Foster, 19, *Jones Street, Birtley, Durham.*

6310 1913. Oct. ‡CAMPBELL, John Thomas, *Public Health Department, Public Buildings, Launceston, Tasmania.*

6311 1913. Oct. ‡CARD, Miss Louise Alice, *Asst. Sanitary Inspector, Brentwood.*

6312 1913. Oct. V CARLTON, Miss Amy Elizabeth, 232, *Harrow Rd., W.*

6313 1913. Oct. S CARNAGHAN, Miss E. C. Winifred, *Physical Training College, Bedford Street, Liverpool.*

6314 1913. Oct. V CLARKE, Miss Gwladys Elizabeth, 2, *North Villas, Hereford.*

6350 1913. Oct. ‡CLARKE, John Henry, 103A, *High Street, Clapham, S.W.*

6315 1913. Oct. S COOK, Miss Gena, 188, *Finchley Road, Hampstead, N.W.*

6316 1913. Oct. ‡CRUMPLER, Miss Constance Clara, *Royston, near Barnsley.*

6317 1913. Oct. ‡DAVISON, John J., 32, *New Street, Wigton, Cumberland.*

6318 1913. Oct. ‡DULY, Richard William, *Herstmonceux, Hailsham, Sussex.*

6319 1913. Oct. ‡DUMBRELL, Alfred, 198, *Jersey Road, Paddington, Sydney, Australia.*

6320 1913. Oct. S FINGER, Miss Georgia Frances, 21, *St. Mary's Terrace, West Hill, Hastings.*

6321 1913. Oct. V FRIEND, Miss Frances Rose, *Chaplain's House, Reading.*

6322 1913. Oct. ‡GOODMAN, Edward Harold, *Cedar House*, 53, *Poppleton Road, Leytonstone.*

6323 1913. Oct. S GRAY, William Smith, *Balliol Road Baths, Bootle, Liverpool.*

6324 1913. Oct. ‡GREEN, Alexander Tilbury, 167, *Chase Side, Enfield.*

6325 1913. Oct. S GREY, Miss Lilian, 61, *Milton Road, Wednesfield, Wolverhampton.*

6326 1913. Oct. ‡GUY, Rupert Victor, *New Road, Wootton, Isle of Wight.*

6327 1913. Oct. ‡HALE, Herbert Spencer, *North Road, Yate, Gloucestershire.*

6328 1913. Oct. ‡HARRIS, Arthur, 59, *Kettering Road, Rothwell, Northampton.*

6329 1913. Oct. ‡HEAD, Eric Burton, *The Bartons, Station Road, Bramley, Surrey.*

6330 1913. Oct. M HOYTE, Cunliffe Malcolm Gustave (37–41, *Drummond Street, Euston, N.W.*), *Accra, Gold Coast Colony, West Africa.*

6331 1913. Oct. V HUGHES, Mrs. Elizabeth, 11, *Station Road, Eckington, Derbyshire.*

6332 1913. Oct. S HUSKINSON, Henry John, 63, *Alderson Road, Alum Rock, Birmingham.*

6333 1913. Oct. ‡INGRAM, Cyril Prendergast, *Church Hill, Carshalton.*

6334 1913. Oct. KEYS, Miss Celia Maud, *Lyndon House, West Bromwich.*

6335 1913. Oct. ‡LININGTON, Frank Arthur, *Elsinore*, 10, *Cæsar's Road, Newport, Isle of Wight.*

6303 1913. Oct. MACKENZIE, Miss Elsie Forbes, B.SC., 15, *Warwick Road, Ealing, W.*

6336 1913. Oct. ‡MacMillan, Miss Sarah Mary, 6, *Norham Road, Oxford.*

6304 1913. Oct. Marks, Harold John, 59, *Rothschild Road, Chiswick, W.*

6337 1913. Oct. ‡Michael, William L., *Panteg, Kilgerran S.O., Pembrokeshire.*

6338 1913. Oct. *v* Milton, Miss Ellen, *Clayhanger, near Chard, Somerset.*

6339 1913. Oct. ‡Morris, Richard Palfrey, 16, *Bridge Street, Kington, Hereford.*

6340 1913. Oct. ‡Moss, George Fred, 36, *Aubrey Road, Hoe Street, Walthamstow.*

6357 1913. Oct. ‡Pickard, Donald Henry, 3, *Winifred Road, Merton Park, S.W.*

6356 1913. Oct. ‡Poole, Bertram Ernest, 6, *Brightland Road, Eastbourne.*

6341 1913. Oct. *v* Potter, Miss Annie, 148, *New Road, Chatham.*

6342 1913. Oct. ‡Saltwell, Miss Emma Daisy, 27, *Ambleside Avenue, Streatham, S.W.*

6343 1913. Oct. *s* Skelton, Miss Ruth Filby, *Western House, Stratton Road, Beaconsfield, Bucks.*

6344 1913. Oct. ‡Smith, Francis Victor Augustus, 4, *Alfred Street, Burton-on-Trent.*

6345 1913. Oct. ‡Squire, Miss E. Louise, "*Roselands*," *Lansdowne Road, Belfast.*

6346 1913. Oct. *v* Stableforth, Miss Beatrice Chastel, 114, *Melrose Avenue, Cricklewood, N.W.*

6347 1913. Oct. ‡Stanbrook, William George, *The Heath, Southend, near Reading.*

6348 1913. Oct. *v* Stanley, Miss Florence Howard Wentworth, 2, *Scroope Terrace, Cambridge.*

6349 1913. Oct. ‡Steele, Arthur Henry Hamerton, *Railway Parade, Kogarah, Sydney, Australia.*

6350 1913. Oct. *M* Turner, Frank Stanley, 71, *Lisson Grove, S. Marylebone, N.W.*

6351 1913. Oct. ‡Whittington, Hugh Knight, *Christchurch Drainage Board, Christchurch, New Zealand.*

6352 1913. Oct. ‡Wilkinson, Miss Ethel Ellen, 70, *Pargeter Road, Bearwood, Smethwick, Worcestershire.*

6353 1913. Oct. ‡Williams, Miss Gwladys Helen, *The Maternity Home*, 210, *Yorkshire Street, Rochdale.*

6354 1913. Oct. *v* Wolff, Miss Nelly Amalia, 29, *Penrith Street, Streatham, S.W.*

6355 1913. Oct. ‡Wood, Edgar Thomas, 194, *Miller Street, North Fitzroy, Victoria, Australia.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY.

AUGUST, SEPTEMBER, AND OCTOBER, 1913.

*** *For publications of Societies and Institutions, etc., see under "Academies."*

ACADEMIES (BRITISH).

Architectural Association. School of Architecture Curriculum, Session 1913-14. 72 pp., 8vo. London, 1913. *The Association.*

Greenwich Royal Observatory. Results of the Magnetical and Meteorological Observations for 1911. *F. W. Dyson, M.A., LL.D., F.R.S.*

Historical Medical Museum. Handbook, 1913. 140 pp., 8vo. London, 1913. *The Museum.*

Institution of Civil Engineers. Minutes and Proceedings, Vol. CXCII. 456 pp., 8vo. London, 1913. *The Institution.*

Institution of Mechanical Engineers. Proceedings, January-February, 1913. 335 pp., 8vo. London, 1913. *The Institution.*

Royal Colonial Institute. Year Book, 1913. 322 pp., 8vo. London, 1913. *The Institute.*

University of Durham. *College of Medicine.* Calendar for the year 1913-14. 193 pp., 8vo. Newcastle-on-Tyne, 1913. *The University.*

Women Sanitary Inspectors Association. Report for the year 1912-13. 28 pp., 8vo. London, 1913. *The Association.*

ACADEMIES (COLONIAL AND FOREIGN).

Bureau communal de Statistique. Budapest székes főváros Statisztikai és Közigazgatási Évkönyve. 8vo. Budapest, 1913. *The Bureau.*

Calcutta Improvement Trust. Joint Report on City and Suburban Main Road Projects, by James Maden and Albert de Bois Shrosbree. 81 pp., 8vo. Calcutta, 1913. *Albert de Bois Shrosbree.*

New York. *Public Library.* Memorial Meeting in honour of the late Dr. John Shaw Billings, April 25th, 1912. 27 pp., 8vo. New York, 1913. *The Library.*

United States. *Bureau of Education.* Report for the year ending June 30th, 1912. Vols. I. and II. 1,316 pp., 8vo. Washington, 1912. *The Bureau.*

Biggs, *J. T.* Leicester: Sanitation versus Vaccination. 784 pp., 8vo. London, 1913. *National Anti-Vaccination League (publishers).*

Blake, *E. H.* Drainage and Sanitation. 519 pp., 8vo. London, 1913. *B. T. Batsford (publisher).*

Board of Agriculture and Fisheries. Prices and Supplies of Corn, Live Stock, and other Agricultural Produce in Great Britain. Vol. XLVII., Part III. 89 pp.

——— Imports and Exports of Corn, Live Stock, and other Agricultural Produce. Vol. XLVII., Part IV. 365 pp., 8vo. London, 1913. *The Board.*

Board of Trade. Report of His Majesty's Commissioners for the International Exhibitions at Brussels, Rome, and Turin, 1910 and 1911. 364 pp., 8vo. London, 1913. *The Board.*

Brownlee, *J., M.D., D.Sc.* Studies in the Meaning and Relationships of Birth and Death Rates. I.—The Relationship between "Corrected Death Rates and Life Table Death Rates." 12 pp., 8vo. London, 1913. *The Author.*

Collie, *Sir John, Kt., M.D., and* **Wightman,** *C. F., F.R.C.S.* Home Health and Domestic Hygiene. 189 pp., 8vo. London, 1913.
The Publishers (George Gill & Sons, Ltd.)

Cruickshank, *L. D., M.D., D.P.H.* School Clinics at Home and Abroad. 171 pp., 8vo. London, 1913.
The National League for Physical Education and Improvement (publishers).

Dunn, *James S.* Methods of To-day. 13 pp., 8vo. Cape Town, 1913.
The Author.

England and Wales, *Registrar-General.* Census, 1911, Vols. VII., VIII., XII. 8vo. London, 1913. *Bernard Mallet (Registrar-General).*

Geological Survey of Great Britain, and the Museum of Practical Geology. Summary of Progress for 1912. 101 pp., 8vo. London, 1913. *The Survey.*

Home Office. Second Report on the Draft Regulations proposed to be made for the Manufacture of Patent Fuel (Briquettes) with the addition of Pitch. 13 pp., fcp.

——— Annual Report of the Chief Inspector of Factories and Workshops, 1912. 274 pp., fcp. London, 1913.
Sir Benjamin Arthur Whitelegge, K.C.B., M.D., D.P.H.

Japan. Report of the Health of the Navy for 1910.
Surgeon-General S. Kimura.

Local Government Board. Forty-Second Annual Report of the Board, 1912–13. 411 pp., 8vo. London, 1913. *The Board.*

——— Dr. J. R. Hutchinson's Report on the Sanitary Circumstances and Administration of the Chadderton Urban District, 13 pp. ;——on an Outbreak of Enteric Fever in the Borough of Colne (Lancs.), 1913, 11 pp.; ——Dr. S. Monckton Copeman's Report on an Outbreak of Enteric Fever in the Borough of Harwich and its Neighbourhood, 1912–13, 18 pp., 8vo. London, 1913. *A. Newsholme, C.B., M.D., F.R.C.P.*

——— Report on Bacterial Food Poisoning and Food Infections, by Dr. W. G. Savage. New Series, No. 77. 153 pp., 8vo. London, 1913.
A. W. J. MacFadden, M.B., D.P.H.

Love, *J. Kerr, M.D.* The Causes and Prevention of Deafness. 127 pp., 8vo. London, 1913.
National Bureau for Promoting the General Welfare of the Deaf (publishers).

Maynard, *E. L.* Infant Care and Management: A Manual for Teachers. 111 pp., 8vo. Leeds. *The Author.*

MEDICAL OFFICERS OF HEALTH AND OTHER SANITARY REPORTS.

Aberdeen, City of, May, June, and July, 1913 .. .. *Matthew Hay, M.D.*

Abertillery U D.C., 1912 .. .. *A. E. Remmett Weaver, M.D., D.P.H.*

Adelaide (S. Australia). Metropolitan County Board. Third Annual Report, 1912, M.O.H., 1912 ..	*T. Borthwick, M.D.*
Berwick C.C., 1912	*Andrew A. McWhan, M.B., D.P.H.*
Birmingham, City of, 1912	*J. Robertson, M.D., B.Sc.*
Blackburn C.B., Education Committee, 1912	*A. Greenwood, M.D., D.P.H.*
Blackpool C.B., 1912	*E. W. Rees Jones, M.D., D.P.H.*
Bombay, City of (India), 1912 ..	*J. A. Turner, M.D., D.P.H.*
Bournemouth C.B., M.O.H. and School M.O., 1912..	*A. D. Edwards, M.B., D.P.H.*
Bradford, City of, 1912	*W. Arnold Evans, M.D., B.Sc.*
Bradford, City of, School M.O., 1912..	*Lewis Williams, M.D., D.P.H.*
Brighton C.B., M.O.H. and School M.O., 1912..	*Duncan Forbes, M.D., D.P.H.*
Bristol, 1912	*D. S. Davies, M.D., LL.D.*
Bury C.B., M.O.H. and School M.O., 1912	*G. Granville Buckley, M.D., D.P.H.*
Cambridge, 1912	*A. J. Laird, M.D., D.P.H.*
Carnarvonshire Combined Sanitary Districts, 1912	*E. L. Parry-Edwards, M.D., D.P.H.*
Cheshire C.C., M.O.H. and School M.O., 1912	*Meredith Young, M.D., D.P.H.*
Christchurch (N.Z.), Drainage Board By-Laws, No. 1, 1913	*E. Cuthbert, M.Inst.C.E.* (*Engineer*).
Cornwall C.C., June, July, and August, 1913	*Robert Burnet, M.B., D.P.H.*
Coventry, City of, 1912	*E. H. Snell, M.D., B.Sc.*
Darlington, 1912	*S. G. Mostyn, M.B., D.P.H.*
Derby C.B., 1912	*A. E. Brindley, M.D., D.P.H.*
Devon C.C., School M.O., 1912 ..	*Geo. Adkins, L.R.C.P., M.R.C.S.*
Fife C.C., 1912	*G. Pratt Yule, M.D., F.R.C.P., B.Sc.*
Georgetown (Demerara), 1912 ..	*W. de W. Wishart, M.B., D.P.H.*
Glasgow, 1912	*A. K. Chalmers, M.D., D.P.H.*
Gloucestershire C.C., 1912	*J. Middleton Martin, M.B., D.P.H.*
Great Yarmouth, 1912	*A. N. Stevens, M.R.C.S., L.R.C.P.*
Greenwich M.B., 1912	*E. G. Annis, M.R.C.S., L.R.C.P.*
Hackney, 1912	*J. King Warry, M.D., L.R.C.P.*
Hertfordshire C.C., 1912	*F. E. Fremantle, M.A., M.B.*
Holborn M.B., 1912	*W. A. Bond, M.D., D.P.H.*
Huddersfield C.B., 1912, and First Quarter, 1913	*S. G. H. Moore, M.D., D.P.H.*
Huntingdonshire C.C., 1912. School Medical Officer and Sanatorium Benefits Report	*C. B. Moss-Blundell, M.D., D.P.H.*

Kent (North-East United Districts), 1912 .. .. *T. Barrett Higgs, M.D., D.P.H.*
Kimberley, 1912. Sanitary Inspector *James S. Dunn.*
Kingston-upon-Hull, 1912 .. .. *J. Wright Mason, M.B., D.P.H.*
Leeds, City of, Sewerage Committee. Extract from the Report for 1912.. *Geo. A. Hart, M.Inst.C.E.*
Lewisham, 1912 .. .. .. *A. Wellesley Harris, M.R.C.S., D.P.H.*
Liverpool, M.O.H. and School M.O., 1912 .. .. *E. W. Hope, M.D., D.Sc.*
London, City of, 1912 .. .. *Wm. Collingridge, M.D., D.P.H.*
London, City of, Eight weeks ending 12th July, 1913 .. .. .. *W. J. Howarth, M.D., D.P.H.*
London, Port of, 1912 .. .. *Herbert Williams, M.D., D.P.H.*
Malden and Coombe U.D.C., 1912 .. *R. Davison, M.D., M.R.C.S.*
Nagpur Municipality, 1911–13 .. *Dr. S. C. Roy.*
Newcastle-on-Tyne, 1912 .. . *H. Kerr, M.D., D.P.H.*
Northampton C.B., 1912 .. .. *J. Doig McCrindle, M.B., D.P.H.*
Northamptonshire C.C., M.O.H. and School M.O., 1912.. .. .. *Charles E. Paget, M.R.C.S., D.P.H.*
Paddington M.B., 1912 .. .. *R. Dudfield, M.B., D.P.H.*
Poplar M.B., 1912 .. .. .. *F. W. Alexander, L.R.C.P., M.R.C.S.*
Punjab, 1912 .. .. *Lt.-Col. S. Browning Smith, D.P.H.*
Rochdale C.B., Quarter ending 30th June, 1913 .. .. .. *A. G. Anderson, M.D., D.Sc.*
St. Helens C.B., 1912 .. .. .. *J. J. Buchan, M.D., D.P.H.*
St. Marylebone M.B., 1912 .. .. *Charles Porter, M.D., B.Sc.*
Salford C.B., 1912, and 2nd Quarter, 1913 .. .. *C. H. Tattersall, L.R.C.P., M.R.C.S.*
Scarborough, 1912 .. .. .. *S. F. Linton, M.B., D.P.H.*
Shrewsbury, 1912 .. .. .. *T. Orr, M.D., D.Sc.*
Southport C.B., Meteorological Department, 1912 .. .. *J. Baxendell, F.R.Met.Soc.*
Stepney, M.B., 1912 .. .. .. *D. L. Thomas, M.R.C.S., L.R.C.P., D.P.H.*
Warwickshire C.C., Education Committee, 1912 .. .. .. *F. E. Larkins, M.D., D.P.H.*
Westminster, 1912 .. .. .. *F. J. Allan, M.D., D.P.H.*
Wigan, C.B., 1912 .. .. .. *F. E. Wynne, M.B., D.P.H.*
Winnipeg, 1912 .. .. .. *A. J. Douglas, M.D.*
Wolverhampton C.B., 1912 .. .. *H. Malet, M.D.*
Woolwich M.B., 1912.. .. .. *S. Davies, M.D., D.P.H.*
York, M.O.H. and School M.O. 1912.. *E. M. Smith, M.D., D.P.H.*

Metropolitan Water Board. Tenth Annual Report for year ending 31st March. 1913. 145 pp., 8vo. London, 1913. *The Board.*

Mill, *Hugh Robert.* British Rainfall, 1912. 372 pp., 8vo. London, 1913. *The Author.*

Pepler, *Geo. L., F.S.I.* What Town Planning means for the Local Authority, for the Landowner. 12 pp., 8vo. London, 1913. *The Garden Cities and Town Planning Association (publishers).*

Perkins, *Dr. J. J., and* **Ballance,** *C. A.* St. Thomas's Hospital Reports. New Series. Vol. XL. 217 pp., 8vo. London, 1913. *J. & A. Churchill (publishers).*

Scotland. *Registrar-General.* Report of the Twelfth Decennial Census. Vol. II. 571 pp., fcap. London, 1913. *J. Patten Macdougall (Registrar-General).*

Siam, *Government of.* Studies on Beri-beri and its Prevention in Siam. *H. Campbell Highet, M.D., D.P.H. (principal M.O.H.)*

Sommerville, *D., M.D., D.P.H.* Aids to Public Health. 143 pp., 8vo. London, 1913. *Baillière, Tindall, and Cox (publishers).*

Spaulding, *R.* Report on the Application of Ozone to Water Purification. 45 pp., 8vo. New York, 1913. *The Author.*

Symonds, *Miss C. M.* Syllabus of Seven Simple Lectures on the Care of Infants and Mothers. 30 pp., 8vo. London, 1913. *Scientific Press, Ltd. (publishers).*

Trask, *J. W.* The Relation of Morbidity Reports to Public Health Administration. 10 pp., 8vo. *The Author.*

Vacher, *Francis, F.R.C.S.,* The Food Inspector's Handbook. 311 pp., 8vo. London, 1913. *The Sanitary Publishing Co., Ltd. (publishers).*

West Riding of Yorkshire Rivers Board. Report upon Biological Work in the Laboratory. 13 pp., 8vo. Report on the Organisms found in Sewage Filters. 18 pp., 8vo. Wakefield, 1913. *H. Maclean Wilson, M.D., B.Sc.*

Wood, Drew, & Co. Analysis of the Accounts of some of the principal Water Undertakings of the United Kingdom for 1911–12. 19 pp., 8vo. London, 1913. *The Authors.*

THE ROYAL SANITARY INSTITUTE.

MEETINGS HELD.

Sessional Meeting.

Swansea. The Meeting was held in the Free Library on Friday, November 21st, at 6.30 p.m. A discussion, opened by Thomas Evans, M.B., D.P.H., M.O.H., and School M.O., Swansea, took place on "Open-air Education and Sanitation," and this was followed by a short description of the Swansea Corporation Town Planning Scheme, by Albert Jenkins, Borough Estate Agent, and Ernest Morgan, A.R.I.B.A., Borough Architect.

On Saturday, November 22nd, visits were made to Open-air Class-room, Cloak-room, Schools, Clinic, and various Cinema Halls and Public Meeting Places, where the systems of ventilation were inspected. The members were entertained to Luncheon by the Mayor, the Chairman, and Members of the Health Committee, and in the afternoon visited the Garden Suburb at Clydach and Corporation Houses.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses have been held at:—

Hong Kong, June 26th, 27th, & 30th. Sheffield, Nov. 7th & 8th.
Kimberley, June 27th & 28th. Newcastle, Nov. 14th & 15th.
Adelaide, July 29th, 30th, & August 4th.

For Inspectors of Meat and Other Foods:—

Bristol, October 31st and November 1st.

For Sanitary Surveyors:—

Bombay, July 11th, 12th, and 14th.

At these Examinations 169 candidates presented themselves, and the following were awarded certificates:—

Sanitary Science as applied to Buildings and Public Works.

Carter, John Ireland, *Sherwood*, Gooding, Arthur T., *Battersea*.

School Hygiene, including Elementary Physiology.

Bernard, Robert, *Jesmond*. Hanson, Joseph Eli, *Dewsbury*.

Women Health Visitors and School Nurses.

CLARK, CHARLOTTE, *Rotherham.*
CURRY, HELEN, *Stanhope.*
DE CUNY, ALICE, *W. Hartlepool.*
FLEMING, MONICA CHRISTINA, *Newcastle.*
FORD, EDITH, *Glasgow.*
FRANKLIN, DOROTHY, *Southampton.*
GIBNEY, GRETTA, *Port William.*
GIBSON, ETHEL, *Bridgend.*
LEE, ELIZA, *Darlington.*
MENNEM, MARGARET, *Amble.*
STEAD, ROSE ELIZABETH, *Prudhoe.*
TAIT, MARGARET JANE, *Morpeth.*
WITCHERLEY, PHŒBE ELIZABETH, *Glasgow.*

Inspectors of Nuisances.

ABEY, EDWARD LUSBY, *Grimsby.*
ATKINSON, JAMES, *Wolsingham.*
BARRETT, ANNA BERTHA, *Adelaide.*
BEAN, WILLIAM, *Newcastle.*
BELL, CHARLES DICKSON, *Camborne.*
BENALLACK, MARY ANN, *Adelaide.*
BOYS, HENRY, *Huddersfield.*
BRIDDICK, THOMAS HESLOP, *S. Shields.*
BOOTH, JAMES CAUSLAND, *Aliwal North.*
CALVERT, NORMAN BEETHOVEN, *Hong Kong.*
CUTHBERTSON, GEORGE, *Gateshead.*
DAVIDSON, ETHEL SARAH, *Adelaide.*
DOWSLAND, ALFRED KING, *Newcastle.*
ELLIOTT, WILLIAM, *Hong Kong.*
GAMLEN, ROBERT CHARLES, *S. Broken Hill.*
GRAHAM, EDWARD, *Jarrow.*
HARPER, ROBERT URWIN, *E. Bolden.*
HARRIS, JOSEPH WILLIAM, *Wadsley Bridge.*
HARRISON, ELLEN, *Sheffield.*
HAY, DAVID, *Kimberley.*
HENDERSON, LUCY, *Blackhill.*
HERITAGE, FELIX HEREWARD G. N., *Frewville.*
HILL, WILLIAM ERNEST, *Heaton.*
HUTCHINSON, JOHN LEO PATRICK, *Darlington.*
JONES, FREDERICK WILLIAM, *Sheffield.*
LIGORES, MANUEL, *Hong Kong.*
MALCOLM, JOAN, *Kimberley.*
MOORE, ARTHUR HARRISON, *Sheffield.*
MORISSE, CONSTANCE, *Johannesburg.*
NORRIS, AQUILA, *Newcastle.*
PENTY, ROBERT, *Selby.*
RAE, THOMAS GILLIES, *Kimberley.*
RALPH, GEORGE ALFRED MAURICE, *Henley Beach.*
REED, THOMAS MIDDLETON, *Brandon Colliery.*
SHAW, FRED, *Sheffield.*
SHAW, WILLIAM, *S. Shields.*
SHREWSBURY, KATE MADELINE, *Hull.*
SIMCOX, THOMAS, *Doncaster.*
SKINNER, ARTHUR WILLIS, *Hull.*
SMITH, ARNOLD HALLAS, *Crookes.*
STRINGFELLOW, FRED, *Consett.*
STURGE-BRAIN, FRANCIS, *Kimberley.*
WALTON, WILLIAM, *Hackenthorpe.*
WILSON, CHARLES, *Pretoria.*
WOODBRIDGE, WILLIAM EDWARD, *Durham.*
WRIGHT, GEORGE WILLIAM, *Jesmond.*

Inspectors of Meat and Other Foods.

GRABHAM, RICHARD, *Llantrisant.*
SMITH, FRANCIS VICTOR AUGUSTUS, *Burton-on-Trent.*
STEVENS, GEORGE WILLIAM, *Reading.*
THOMAS, DAVID, *Pontymister.*

Sanitary Surveyors.

ABBAS, S. N., *Bombay.*
AHLUWALIA, BABOO RAM, *Jullundur.*
ASPANDIARJI, JAMSEDJI, *Mazagon.*
ATHAVALE, C. R., *Baroda.*
BELLIMAL, A. S., *Bombay.*
BHATT, LALSHANKER JAYANAND, *Kattiawad.*
BHAYA, SORAB CURSETJI.

CHADDHA, DINANATH, *Jubbulpore.*
DAVLE, NARAYAN PARSHURAM, *Berar.*
DUTT, JOHN P., *Saugor.*
DUTT, S. C., *Lucknow.*
GANDHI, MUL RAJ, *Amritsar.*
GUPTA, GANESH PRASAD, *Hoshangabad.*
JOSHI, SHEORAM GOVIND, *Nagpur.*
KOTHARE, GANPATRAO MORESHWAR, *Bombay.*
MEHTA, RAJINDRA KRISHNA, *Ludhiana.*
NAIDU, P. VEERASAWMY, *Coimbatore.*
NAIR, K. KOCHUKRISHNAN, *Travancore.*
NAIR, P. VASUNNI, *Bombay.*
NIVSARKAR, S. N., *Indore.*
PANDE, G. B., *Ellichpur.*
PILLAY, P. M. PARAMASWARAN, *Trevandrum.*
PRADHAN, SHANKAR YESHWANT, *Bombay.*
PRINTER, KAIKHASRU HIRJIBHAI, *Bombay.*
PRINTER, PHEROZSHA DOSSABHAI, *Bombay.*
RAJ, S. V., *Burma.*
SAKSENA, DEBI PRASAD, *Lucknow.*
SINGH, BAWA SANT, *Shahpur.*
SOHONY, V. N., *Parel.*
TALPADE, VINAYAK VASUDEO, *Bombay.*
VAIDYA, DINANATH, *Amritsar.*
VENKATRAO, S., *Bilaspur.*

FORTHCOMING MEETINGS.

SESSIONAL MEETINGS.

London, Tuesday, December 9th, at 7.30 p.m. Discussion on "The Progress of School Hygiene," to be introduced by a Report of the Fourth International Congress on School Hygiene at Buffalo, by James Kerr, M.A., M.D., D.P.H., Medical Research Officer, London County Council.

CONGRESS AND EXHIBITION, 1914.

The Right Hon. the Earl of Derby, G.C.V.O., P.C., D.L., has consented to act as President of the Twenty-ninth Congress and Exhibition of the Institute, to be held at Blackpool by invitation of the Corporation from July 6th to 11th, 1914.

EXAMINATIONS.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors Qualifying for Membership, for Inspectors of Nuisances, for Smoke Inspectors, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses :—

Manchester, November 28th and 29th.
London, December 5th and 6th.
Plymouth, January 23rd and 24th, 1914.

For Inspectors of Meat and Other Foods :—
London, December 12th and 13th.

LIST OF MEMBERS AND ASSOCIATES

ELECTED NOVEMBER, 1913

MEMBERS.

§ Marked thus have passed the Institute's Examination for Sanitary Surveyors (India).
* Marked thus have passed the Examination of the Institute in Sanitary Science as applied to Buildings and Public Works.

3557 1913. Nov. ATALLA, Mohamed Ali, M.S.A., *Saida Zenab, Cairo.*
3558 1913. Nov. BAKER, Herbert Stainer, M.R.C.S., L.R.C.P.LOND., *(M.O.H.), Council Buildings, Rushden, Northants.*
3559 1913. Nov. BERRY, William Arthur, M.B.LOND., D.P.H.OXON., *(Deputy M.O.H.), Town Hall, East Ham, E.*
3560 1913. Nov. CHATTERJIE, Girish Chandra, L.M.S.PUNJAB, *Assistant Surgeon, Umaria Hospital, Umaria, Rewah State, Central India.*
3561 1913. Nov. GANTAM, Dina Nath, *Hoshiarpur, Punjab, India.*
3562 1913. Nov. GHOSH, Satish Chandra, B.SC.(ENG.)GLASG., 9, *Strathmore Gardens, Glasgow.*
3563 1913. Nov. GILES, James Alfred, M.B., B.S., D.P.H., *(M.O.H.), The Cottage, Wallsend-on-Tyne.*
3564 1913. Nov. HOLME, George, M.SC., B.ENG., *Imperial Public Works Dept., Tavoy, Lower Burma, India.*
3569 1913. Nov. *HOLMES, Herbert George Maxwell, *Sind House, Luton Road, Chatham, Kent.*
3565 1913. Nov. KNOX, Robert, *(Chief Inspector, Dunedin Drainage Board), 363, Leith Street, Dunedin, New Zealand.*
3566 1913. Nov. MACRAE, Farquhar, M.B., CH.B., M.D., *Tuberculosis Officer, County Buildings, Aberdeen.*
3567 1913. Nov. ORR, James, L.R.C.P., L.R.C.S.ED., D.P.H., *(M.O.H.), Town Hall, Barrow-in-Furness.*
3568 1913. Nov. §PILLAI, N. Muthookrishna, *Puthenchantai, Trivandrum, Travancore, India.*
3570 1913. Nov. SAVAGE, Wm. George, M.D., M.B., M.R.C.S. *(M.O.H.), Hafton, Uphill Road, Weston-super-Mare.*

ASSOCIATES.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.
V Marked thus have passed the Examination of the Institute for Women Health Visitors and School Nurses.

6359 1913. Nov. ‡ARNOTT, Hugh, *P.O. Box 100, East Rand, Transvaal.*
6360 1913. Nov. VBINGLE, Miss Alice, 12, *Tentercroft Street, Lincoln.*
6361 1913. Nov. ‡BROWN, Thomas Oswald, 7, *Wakefield Avenue, Edinburgh.*
6362 1913. Nov. VCRESWELL, Miss Katy, *Rose Cottage, Sutton Bonington, Loughborough.*
6363 1913. Nov. ‡CUNNINGHAM, William, *Sanitary Inspector, Wallsend, New South Wales.*
6364 1913. Nov. VGOBERT, Miss Margaret Jane, 31, *Church Terrace, Tylorstown, Rhondda.*
6365 1913. Nov. ‡LYNAM, William Arthur Tatton, *Town Hall, Ripley, Derbyshire.*
6367 1913. Nov. ‡WEBB, Ben, *c/o Colonial Secretary, Freetown, Sierra Leone, West Africa.*
6366 1913. Nov. ‡WENNHOLM, Sigfrid, Waldemar, *Rutland Street, Kogarah, New South Wales.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY.

*** *For publications of Societies and Institutions, etc., see under "Academies."*

NOVEMBER, 1913.

ACADEMIES (BRITISH).

Architectural Association. Brown Book. Session 1913–1914. 228 pp., 8vo. London, 1913. *The Association.*

British Association for the Advancement of Science. Report on the Influence of School Books upon Eyesight. 33 pp., 8vo. London, 1913. *The Association.*

Lister Institute of Preventive Medicine. Collected Papers, No. 9. Part I.—Bacteriological, Pathological, and Epidemiological Papers. Part II.—Physiological, Zoological, and Biochemical Papers. 8vo. London, 1912–13, *The Institute.*

Royal College of Surgeons of England. Calendar, 1913. 398 pp., 8vo. London, 1913. *The College.*

Royal Institute of British Architects. Kalendar, 1913-1914. 502 pp., 8vo. London, 1913. *The Institute.*

University of London. Calendar, Session MDCCCCXIII—MDCCCCXIV. 597 pp., 8vo. London, 1913. *The University.*

ACADEMIES (FOREIGN).

David Ranken, Jr., School of Mechanical Trades. Fourth Annual Catalogue, 1913. 43 pp., 8vo. *The School.*

Hamburgischen Staates. Bericht über die Medizinische Statistik für das Jahr, 1912. 88 pp., 8vo. Hamburg, 1913. *Die Staates.*

National Association for the Study and Prevention of Tuberculosis. Transactions of the Ninth Annual Meeting, 1913. 420 pp., 8vo. Philadelphia, 1913. *The Association.*

Smithsonian Institution. Report on the Progress and Condition of the United States National Museum for the year ending June 30th, 1912. 165 pp., 8vo. Washington, 1913. *The Institution.*

Durrant, *J. Hartley, F.E.S., and* **Beveridge,** *Lt.-Col. W. W. O., D.S.O., R.A.M.C.* A Preliminary Report of the Temperature reached in Army Biscuits during Baking, especially with reference to the Destruction of the Imported Flour Moth. 30 pp. 8vo. London, 1913. *Lt.-Col. W. W. O. Beveridge.*

England and Wales Registrar-General. Seventy-fourth Annual Report of Births, Deaths and Marriages, 1911. 577 pp., fcap. London, 1913. *Bernard Mallett (Registrar-General).*

Graham-Smith, *G. S., M.D.* Flies in Relation to Disease—Non-Bloodsucking Flies. 292 pp., 8vo. Cambridge, 1913. *The Cambridge University Press (Publishers).*

Heap, *Harri., M.Sc., F.I.C.* A Contribution to the Study of the Actions of various Waters upon Lead. 68 pp., 8vo. London, 1913. *Prof. S. Delepine.*

Hoffman, *F. L., LL.D.* The Present Position of Municipal Vital Statistics in the United States. 19 pp., 8vo. *The Author.*

Holden, H. Why Is This So? A Consensus of Qualified Opinion upon a Cause of Pelvic Disease. 60 pp., 8vo. Guildford, 1910. *The Author.*

Hope, *E. W., M.D., D.Sc.* **Browne.** *E. A., F.R.C.S.E., and* **Sherrington,** *C.S., M.D., F.R.S.* A Manual of School Hygiene. 311 pp., 8vo. Cambridge, 1913. *The Cambridge University Press (Publishers).*

Johannesburg (S.A.). Report on the Circumstances of Milk Production in and around Johannesburg. 35 pp., fcp. Johannesburg, 1913.
Charles Porter, M.D., D.P.H.

Kaye-Parry, *W., F.R.I.B.A.* Progress in the Purification of Sewage. 50 pp., 8vo. Dublin, 1913. *The Author.*

Local Government Board (England). Further Reports (No. 6) on Flies as Carriers of Infection. New Series, No. 85. 46 pp., 8vo. London, 1913.

——— Dr. Morgan Rees's Report on Conditions of Housing and other Sanitary Circumstances in the St. Dogmell's Rural District. New Series, No. 82. 12 pp., 8vo. London, 1913. *A. Newsholme, M.D., F.R.C.P.*

Local Government Board (Scotland). Housing Acts. Hints on the Provision of Houses by Local Authorities. 3 pp., fcap. Edinburgh, 1913. *The Board.*

MEDICAL OFFICERS OF HEALTH AND OTHER SANITARY REPORTS.

Aberdeen, *City of,* August, 1913	*Matthew Hay, M.D.*
Calcutta, 1912	*H. M. Crake, M.D., D.P.H.*
Capetown, 30th June, 1913	*A. Jasper Anderson, M.B., D.P.H.*
Cork, 1912	*D. D. Donovan, L.R.C.P.E., L.R.C.S.E.*
Cornwall C.C., September, 1913	*R. Burnet, M.B., D.P.H.*
Doncaster R.D.C., 1912	*A. B. Dunne, M.B., D.P.H.*
Essex, 1912	*J. C. Thresh, M.D., D.P.H.*
Huddersfield C.B., 2nd Quarter, 1913	*S. G. Moore, M.D., D.P.H.*
Huntingdonshire C.C., 1912	*C. B. Moss-Blundell, M.D., D.P.H.*
London, *City of,* Ten Weeks ending 20th September, 1913, and Four Weeks ending 18th October, 1913	*W. J. Howarth, M.D., D.P.H.*
Newport C.B., 1912	*J. Howard Jones, M.D., D.Sc.*
Nottinghamshire C.C., 1912	*H. Handford, M.D., D.P.H.*
Rochdale, Quarter ending 30th September, 1913	*A. G. Anderson, M.D., D.Sc.*
Salford, Third Quarter, 1913	*C. H. Tattersall, L.R.C.P., M.R.C.S.*
West Riding C.C., 1912	*J. R. Kaye, M.B., D.P.H.*

Newsholme, *A., M.D., F.R.C.P.* Hygiene. A Manual of Personal and Public Health. 356 pp., 8vo. London, 1913. *Geo. Gill & Sons, Ltd. (Publishers).*

New South Wales. Report on the Working of The Factory and Workshops Act for 1912. 57 pp., 8vo. Sydney, 1913.
C. J. Alderdice (Chief Inspector of Factories).

O'Connor, *John J., A.B.* The Economic Cost of the Smoke Nuisance of Pittsburgh. 46 pp., 8vo. Pittsburgh, 1913.
Mellon Institute of Industrial Research and School of Specific Industries.

Parkes, *Louis C., M.D., D.P.H. and* **Kenwood,** *H. R., M.B., D.P.H.* Hygiene and Public Health. 736 pp., 8vo. London, 1913. *H. K. Lewis (Publisher).*

Scott, *W., F.R.V.C.S.* Clinical Bacteriology and Vaccine Therapy for Veterinary Surgeons. 222 pp., 8vo. London, 1913.
Baillière, Tindall & Cox (Publishers).

Stevens, *B. C., M.D., M.S., D.P.H.* How Sanatorium Benefit may be temporarily administered in Boroughs and Urban Districts. 16 pp., 8vo. *The Author.*

Taylor, *G. C., M.D., D.P.H.* Statistical Ready Reckoner. 409 pp., 8vo. Reading, 1913. *The Author.*

Wanklyn, *W. McC., M.R.C.S., L.R.C.P.* The Administrative Control of Small-Pox. 86 pp., 8vo. London, 1913.
Longmans, Green & Co. (Publishers).

COLONIAL NOTES.

Indian Empire.

Examinations for Sanitary Inspectors in Burma.

The Royal Sanitary Institute and the Government of Burma have agreed to co-operate in the holding of Examinations in Rangoon for Sanitary Inspectors (India), and in granting certificates to successful candidates.

A class for training Sanitary Inspectors will be held in Rangoon under the Health Officer of the Rangoon Municipality. The course of training will be open to candidates nominated either by a Municipal or Town Committee with the approval of the Commissioner of the Division, or by the Commissioner himself, provided that they possess educational qualifications not lower than the Seventh Standard Anglo-Vernacular. The course will also be open to Sanitary or Conservancy Inspectors already in the employ of Municipal or Town Committees and nominated by the latter, whether they possess the preliminary educational qualification or not; but no such candidate will be allowed to attend the class without the previous sanction of the Commissioner.

The fee for the course, which will last about six months, will be Rs. 150, payable in advance.

Students will be attached to the Health Department, Rangoon, for about six months from January to June, and from July to December, during which time they will receive instruction in the subjects mentioned in the syllabus. About 60 lectures and demonstrations will be given, and Examinations will be held in June and December respectively.

The Board of Examiners is as follows:—

The Sanitary Engineer, Burma.
The Chief Engineer, Rangoon Municipality.
The Water and Sewage Engineer, Rangoon Municipality.
The Health Officer, Rangoon Municipality.
A Government Medical Officer.

Dominion of Canada.

Provincial Examination Boards.

For many years The Royal Sanitary Institute have been holding Examinations for Sanitary Officers in the Dominion of Canada, with the assistance of Professor T. A. Starkey, of McGill University, Montreal. Several Examinations have been held in Montreal and in Winnipeg, but now that increasing attention is being given to Sanitation and to the development of the Public Health Service, it has been considered desirable to establish Examination Boards in each of the

Provinces of the Dominion. A Board of Examiners has been appointed in Winnipeg for the Province of Manitoba, consisting of:—

Dr. A. J. Douglas, Professor of Hygiene, Manitoba Medical College, and Medical Officer of Health, Winnipeg.

Dr. Gordon Bell, Professor of Bacteriology and Pathology, University of Manitoba; Provincial Bacteriologist, Manitoba.

E. Brydone Jack, M.Am.Soc.C.E., M.Can.Soc.C.E., Professor of Engineering, University of Manitoba.

Dr. R. M. Simpson, Chairman, Provincial Board of Health for Manitoba.

J. Pender West (Architect), Winnipeg.

P. B. Tustin, Chief of Food and Dairy Division, City of Winnipeg. (Hon. Local Secretary.)

Arrangements for Boards in other Provinces are in progress, and will be announced when they are completed.

Branch in British Columbia.

A Branch of the Institute has been formed in British Columbia with Dr. F. T. Underhill of Vancouver as the Chairman, and Mr. Laurence Robertson as Secretary and Treasurer. The first meeting for the reading and discussion of papers was held in Victoria on October 22nd. An Address was given by Dr. W. E. Home, R.N., on "The Work of The Royal Sanitary Institute," and papers were read by Miss Alice Ravenhill, Dr. H. J. Wasson, Mrs. P. McNaughton, and by the Bishop of Columbia, dealing with the subjects of School Hygiene and Public Health Administration, and Legislation in British Columbia.

HEALTH EXHIBITION, EXETER, 1913.

ADDITIONAL AWARDS.

Silver Medal.

The British Sanitary Company.
Self-Acting Earth Closets.

Bronze Medal.

Edwin Mansfield & Co.
Wireless Electric Pipe Locator.

THE ROYAL SANITARY INSTITUTE.

REVIEWS OF BOOKS.

The Food Inspector's Handbook.*

A further edition of the well-known Handbook has been called for, after a period of five years since the issue of the previous edition. From a paper on "The Physical Appearances of Sound and Unsound Food," published in 1885, it has, through successive editions, become enlarged into a work of over 300 pages, in which a general survey of the problems associated with food inspection is attempted. That it meets a want is proved by the success which has attended its publication. In the present edition, a place has very rightly been found for particulars relating to the cutting up of carcases into the various joints. Additional illustrations have been added, and the chapters dealing with Fish, Fruit, and Vegetables have been extended. The increase in the consumption of frozen and chilled meat would appear to justify a somewhat more extended reference. The same might be said of other subjects, though, if the suggestion were adopted generally, the book might fail in its obvious object, and require to be considered in another category. W. J. H.

Flies in Relation to Disease; Non-Bloodsucking Flies.†

Dr. Graham Smith's book makes a very welcome appearance at the present time, when so much attention is being called to the part played by flies as carriers of disease. The work brings together in one volume a large number of scattered observations, and very impartially reviews the evidence available on the disease-carrying powers of flies. A very useful terminal chapter summarises the conclusions which may at the present time be justly formed on the subject.

The common house-fly, *Musca domestica*, occurs in all parts of the world, and is the fly most commonly found in houses; in the height of the fly-season at least 90 per cent. of the flies caught on sticky papers or in traps belong to this species. The experimental evidence associating flies with the carriage of infective bacteria on their hairy legs and feet and proboscides, and the deposition of such bacteria on the food materials of man, is now abundant; and there can be no doubt that the same infectivity applies to the regurgitation or vomit from the crop of the fly, and to the fæces discharged from the intestine of the fly, if it has recently fed on infected material. On *a priori* grounds, then, there is strong support to the theory that flies are potent agents of infection in such diseases as enteric fever, cholera, and summer diarrhœa, where the urine and fæces of persons suffering from these diseases contain the specific causative microbes.

On the other hand, the bacteriological evidence connecting "wild" flies (*i.e.*,

* The Food Inspector's Handbook, by Dr. Francis Vacher. Sixth Edition. 311 pp. 8vo. London, 1913. The Sanitary Publishing Co.

† Flies in Relation to Disease; Non-Bloodsucking Flies, by G. S. Graham-Smith, M.D. University Lecturer in Hygiene. 292 pp., 8vo. Cambridge, 1913. Price 10s. 6d.

flies in a state of nature, which have not been conditioned by any subjection to experiment with infective materials) with the spread of specific diseases is still very incomplete. Some of the evidence available is too old, and some too imperfectly recorded to be satisfactory. Bacteria also of many kinds are present in great numbers in the intestines of flies: and several varieties of these indigenous bacteria closely resemble important disease-producing types in man, so that the isolation and identification of suspected bacteria in the intestine of the fly are matters of difficulty, and only to be attempted by expert workers. Only a small proportion of the flies found at any time, even under conditions the most provocative of disease, are at all likely to be infected with specific pathogenic bacilli: and owing to the long incubation period of some of the diseases under consideration the specifically infected flies may have disappeared before the disease is recognised and investigations can be started.

In tropical and sub-tropical countries, where at certain seasons and in certain places flies are found in enormous numbers, there is the strongest reason for believing that flies play a very important, and possibly the most important, part of all natural causative agencies in disease production. In temperate climates, and especially in England, flies are in most places comparatively infrequent, except in very hot summers and in certain localities where collections of manure and refuse afford suitable breeding grounds for the larvæ. The presence of flies in large numbers, and of outbreaks of summer diarrhœa, show a very definite correlation, and both are invariably associated with high summer air temperatures continued over a considerable period; but until a specific bacillus for summer diarrhœa has been isolated, the exact method by which this disease is propagated must remain little more than a matter of suspicion. Morgan's bacillus has the greatest claim to be regarded as the specific organism, but it is not invariably present, and it may indeed be true that summer diarrhœa may be set up by more than one organism. All that can be said at present is that flies in this country probably contribute to the spread of filth diseases, such as enteric fever and diarrhœa, and that in consequence every effort should be made to limit the number of flies. This can only effectually be done by abolishing the collections of fæcal matter, manure, kitchen and vegetable refuse which form the breeding grounds of nearly all the various species of flies which can be regarded as possible carriers of disease. The now almost universal introduction of water-closets and water-carried sewage in our towns, combined with the great reduction in the numbers of town stables, due to motor traffic, is gradually solving the problem of abolishing the house-fly, but much yet remains to be done. L. C. P.

Clinical Bacteriology and Vaccine Therapy*

This little book is both interesting and instructive. It shows how promptly the veterinary profession have adopted the principles of vaccine therapy and adapted them for treatment of disease in the lower animals.

It commences with a full account of the preparation of the various media and other accessories necessary for the cultivation and isolation of bacteria, and the preparation of vaccines.

It then gives in a clear and concise manner Erlich's theory of the formation of antitoxins by side chains or receptors in the animal body, and a detailed

* Clinical Bacteriology and Vaccina Therapy, for Veterinary Surgeons, by William Scott, M.R.C.V.S. 222 pp., 8vo. London, 1913. Bailliere, Tindall & Cox. Price 7s. 6d.

description of complements, amboceptors, opsonins, etc., details which it is necessary to know before an intelligent attempt can be made to carry out vaccine therapy.

The dosage likely to be suitable under varying conditions is then discussed at length.

The successful results that are stated to have been obtained in the treatment of such obstinate conditions as poll-evil, fistulous withers, and follicular mange will, it is hoped, stimulate others to recommend, and, where possible, themselves carry out treatment on these lines.

Whilst the successful prophylaxis, and in early cases also the cure of distemper, will be welcomed by those whose practice is very largely canine.

It finishes with lengthy articles on tuberculosis and swine fever, and an appendix dealing with weights and measures, etc.

The book covers a very wide field, including, as it does, most of the conditions in which vaccine therapy is of use. One disease, however, which is extremely prevalent in this country, and which is a great source of loss to agriculturists, has unfortunately been omitted, and that is epizootic abortion in cows. This is a disease where vaccine therapy should be of the greatest value, and it is to be hoped that in a subsequent edition the author will find for it the place it should occupy in such an otherwise useful book. A. R. L.

A Manual of Practical Chemistry for Public Health Students.*

This small book which has been specially written to meet the needs of students for the Department of Public Health is barely sufficient for the purposes intended, but it contains a considerable amount of useful and clearly expressed information. By an oversight the recommendations of the Royal Commission on Sewage Disposal with reference to standards for sewage effluents which are given are not the most recent; but with this exception the information is quite sound and up-to-date, and the book should prove to be a useful little bench guide. H. R. K.

---

* A Manual of Practical Chemistry for Public Health Students, by A. W. Stewart, D.Sc., Assistant Demonstrator of Chemistry at the Royal Institute of Public Health. 75 pp. London, 1913. John Bale, Sons & Danielsson, Ltd. Price 3s. 6d.

MEETINGS HELD.

Sessional Meeting.

London. The meeting was held at the Institute on Tuesday, December 9th, at 7.30 p.m., when a discussion on "The Progress of School Hygiene," introduced by a Report of the Fourth International Congress on School Hygiene at Buffalo, was opened by James Kerr, M.A., M.D., D.P.H., Medical Research Officer, London County Council. The Chair was taken by Sir William J. Collins, D.L., J.P., M.D., M.S.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses have been held at:—

Manchester, Nov. 28th and 29th. London, Dec. 5th and 6th.
Perth, Western Australia, August 8th to 13th.

For Inspectors of Meat and Other Foods:—
London, December 12th and 13th.

At these Examinations 232 candidates presented themselves, and the following were awarded certificates:—

Sanitary Science as applied to Buildings and Public Works.

Barnard, Leonard, *Leatherhead.*
Chignall, Leonard Montague, *E. Dulwich.*
Dear, Cyril, *Paddington.*
Evans, Frederick William Ricketts, *Claremont, W.A.*
Hoyte, Cunliffe Malcolm Gustave, *Euston.*

School Hygiene, including Elementary Physiology.

Bacon, Annie, *Ramsgate.*
Birch, Eva Marion, *Gosforth.*
Browne, Edith Dumaresq, *Aintree.*
Collen, Eleanor Cresswell, *Wandsworth.*
Eagar, Nellie Margaret Grace, *Folkestone.*
Harker, Bertha, *Prestwich.*
Howson, Mabel, *Latchford.*
McMahon, Kathleen Gladys Beatrice, *Stockwell.*
Riley, John, *Leederville, W.A.*
Smith, Mabel Bruce, *Lee.*
Stewart, David George, *Perth, W.A.*
Wicksteed, Jane Honora, *London.*

Women Health Visitors and School Nurses.

Arnold, Elsa Mary, *Manley Park.*
Arthur, Emma, *Leamington.*
Brown, Ida Margaret Alexis, *Uxbridge.*
Burnham, Florence, *Bow.*
Butler, Rose, *Oxford.*
Clappen, Ethel Hannah, *Putney.*
Davis, Zillah Rose, *Balham.*
Dutton, Annie, *Colchester.*
Grant, Margaret, *York.*
Grundey, Annie Elizabeth, *Darlington.*
Hackett, Edith Mary, *Ravenscourt Park.*
Hewton, Eleanor, *Belfast.*
Holland, Emily, *Wakefield.*
Holman, Alice Mary Louisa, *Wimbledon.*
Hoskin, Lillie, *Plaistow.*
Hough, Florence Jessie, *Coulsdon.*

Hughesdon, Constance, *St. Albans.*
Hyett, Margaret Coakley, *Cardiff.*
Kelson, Annie Mortimer, *Chesterfield.*
King, Constance Mary, *Blisworth.*
King, Sarah Louisa Gibson, *Carlisle.*
Laing, Mary, *Aberdeen.*
Lenanton, Helen Grace, *Harlesden.*
Lindsay, Maud Hume, *Fremantle, W.A.*
Maybury, Mary Ann, *Camberwell.*
Mercer, Ida, *Kingston-on-Thames.*
Middleton, Muriel M., *Midhurst.*
Mountford, Lucy Minnie, *Willesden.*
Neve, Lilian Edith, *Maida Vale.*
Parsons, May Ratcliffe, *Wellingboro'.*
Partridge, Helen Irene, *Parkstone.*
Peddar, Gertrude May, *Beckenham.*
Pryce, Katherine Marion, *Rhyl.*
Reade, Florence, *S. Norwood.*
Richardson, Amy Gertrude, *King's Norton.*
Squire, Emily Louise, *Belfast.*
Turnbull, Alice, *Brill.*
Tydeman, Winifred Lois, *E. Dulwich.*
Wain, Edith, *Poplar.*
Wallace, Elizabeth, *Stanhope.*
Wallington, Florence May, *Plumstead.*
Walsh, Alice Ada, *Darwen.*
Webb, Martha Mary, *Letchworth.*
Williams, Gwyneth Olwen, *Cardiff.*
Wright, Kate Louisa, *Camberwell.*

Inspectors of Nuisances.

Allsopp, George, *Sevenoaks.*
Almond, Joseph, *St. Helens.*
Arnold, Robert Henry John, *Portsmouth.*
Ashton, Tom Welsby, *Newton Hyde.*
Broadhurst, Samuel, *Cadishead.*
Berry, Henry, *Guildford, W.A.*
Bettis, Albert Edward, *West Ham.*
Brown, Thomas Charles, *Enfield,*
Bullock, Richard Charles, *Swansea.*
Burton, George, *Rotherham.*
Butcher, Albert, *Weybridge.*
Clarke, John Patrick, *Twickenham.*
Cleeve, Cecil John, *Woking.*
Cooper, George William, *Chertsey.*
Coughlin, James Joseph, *Hightown.*
Coulter, Sydney, *Enfield.*
Craig, Henry John, *Osborne, W.A.*
Creswell, William Edward, *Chichester.*
Crouch, Alfred, *Bristol.*
Dalley, George Frederick Vaughan, *Moss Side.*
Ellis, Sarah Georgina, *Liverpool.*
Evans, Frederick William Ricketts, *Claremont, W.A.*
Flanagan, John, *Hull.*
France, Thomas, *Leigh.*
Franks, Alfred Jenner, *Brighton.*
Garner, Sam, *Macclesfield.*
Grubb, John Forster, *Chiswick.*
Hardman, Thomas Plant, *Patricroft.*
Harris, James Herbert, *Chatham.*
Hiorns, Zilla Ella, *Blundellsands.*
Holbrow, Henry, *Leighton Buzzard.*
Hughes, Sarah, *Market Harborough.*
Hunt, Arthur, *Godalming.*
Kennett, George Henry, *Westbourne Park.*
Kidd, Ronald Hubert, *Hampstead.*
Lewis-Driver, Edgar, *Beaconsfield, W.A.*
Lewis, Llewellyn Olorenshaw, *Weybridge.*
Lewis, Walter Henry, *Wembley.*
Marsden, Enoch, *Bradford.*
Millar, Thomas Hutton, *Stockport.*
Mitchell, William Arnold, *Slough.*
Morgan, Frederick John, *Maidenhead.*
Munns, William, *Belvedere.*
Nuttall, Joe Booth, *Rochdale.*
O'Meara, Thomas Francis, *Hr. Broughton.*
Opie, Percy Langdon, *Derby.*
Owen, Thomas, *Aberystwyth.*
Pitstow, William, *Cambridge.*
Pitts, Edward James, *Rotherhithe.*
Prescott, Ernest, *Leigh.*
Puxley, Zoe Lavallin, *Pinner.*
Rackham, Stanley George, *Kentish Town.*
Saunders, William George, *Gosport.*
Sefton, Ernest, *Blackburn.*
Shaw, Edmund Burbidge, *Southsea.*
Shiner, Gladys Marguerite, *London.*

SINCLAIR, GEORGINA, *N. Perth, W.A.*
SLADE, CECIL WILLIE, *Hanwell.*
SMALL, FRANCES, *W. Gorton.*
TUNBRIDGE, HENRY, *Folkestone.*
TYLER, REGINALD WALTER, *Newport.*
WEBB, LEONARD C., *Chiswick.*
WHEATMAN, PATTY, *Manningham.*
WILLIAMS, THOMAS EDWIN, *Northenden.*

Inspectors of Meat and other Foods.

ALLEN, FRANCIS JOHN, *Rushden.*
CAFFYN, HARRY, *Petworth.*
CANTONI, MARIO, *Chelsea.*
COATES, WILLIAM OWEN, *Edmonton.*
CROFTS, THOMAS JOHN, *Bristol.*
GIBBS, WALTER ROBERT, *Gillingham.*
HEAD, ERIC BURTON, *Bramley.*
JOHNSON, STANLEY H., *Hurlingham.*
JONES, EVAN, *Whitchurch.*
MARKS, HAROLD JOHN, *Chiswick.*
RATCLIFF, CHARLES GEORGE JOHN, *Queenborough.*
ST. CLAIR, CHARLES HOME DOUGLAS, *Capt., A.S.C., Aldershot.*
SIMPSON, ROBERT, *Brockley.*
STACEY, HENRY, *Chesham.*
STEVENSON, MARCUS, M.R.C.V.S., *Holloway.*
STILES, AMBROSE WILLIAM, *Tottenham.*
WALKER, ALBERT HORACE, *E. Finchley.*
WHEELER, HAROLD EDWARD, *Camden Town.*
WILSON, GEORGE WILLIAM, *Westcliff.*

HEALTH WEEK.

A special meeting of the Conference of Municipal Representatives was held at Exeter to consider the future of the Health Week organisation.* The Conference was attended by representatives from many districts in England, a number of whom spoke in favour of the following resolution, which was unanimously passed:—

"That the Council of The Royal Sanitary Institute be asked to undertake the organisation of 'Health Week,' in order that the movement may be conducted on sound lines."

This resolution was considered by the Council, and it was resolved:—

"That the Council of The Royal Sanitary Institute fully appreciate the good work that has been done by the Health Week movement, but until experience of the working has been obtained, they are not prepared to assent entirely to the suggestion that The Royal Sanitary Institute is the most suitable body to undertake the future organisation of the movement. In consideration, however, of the opinion expressed at the Conference at Exeter, they will appoint a General Committee, and will give this Committee such assistance as may be found practicable in the organisation and carrying on of the work for the year 1914.

"That this Committee be styled the 'Health Week Committee appointed by The Royal Sanitary Institute,' and be constituted of members selected from (*a*) the Council of the Institute; (*b*) those who have been associated with the organisation of the movement; and (*c*) others whose influence would be helpful in the work."

* A Report of the Conference is given on page 631 of the Journal.

In furtherance of this resolution invitations have been issued, and those who have so far consented to join the General Committee are given in the following list:—

Chairman.

THE RIGHT HON. THE LORD MAYOR OF LONDON.

Vice-Chairman.

SIR HENRY TANNER, C.B., I.S.O., F.R.I.B.A.

Chairman of Executive Committee.

PROF. A. BOSTOCK HILL, M.Sc., M.D., D.P.H., M.O.H. Warwickshire C.C.

Committee.

H.E. THE COUNTESS OF ABERDEEN, President, Women's National Health Association of Ireland.
RT. HON. THE EARL OF PLYMOUTH, P.C.
RT. REV. BISHOP OF HEREFORD.
RT. REV. BISHOP OF BIRMINGHAM.
RT. REV. BISHOP BOYD CARPENTER, K.C.V.O., Chairman National Physical League.
RT. REV. BISHOP WELLDON, DEAN OF MANCHESTER.
RT. HON. JOHN BURNS, M.P.. President Local Government Board.
LORD PROVOST OF GLASGOW.
LORD MAYOR OF CARDIFF.
LORD MAYOR OF DUBLIN.
LORD MAYOR OF LIVERPOOL.
LORD MAYOR OF MANCHESTER.
LORD MAYOR OF NEWCASTLE-UPON-TYNE.
SIR LAUDER BRUNTON, Bart., LL.D., M.D., F.R.S.
THE HON. SIR JOHN A. COCKBURN, K.C.M.G., M.D.
LIEUT.-COL. THE HON. SIR NEWTON JAMES MOORE, K.C.M.G., Agent-General for Western Australia.
SIR EDWARD BRABROOK, C.B.
SIR JAMES CRICHTON BROWNE, LL.D., M.D., F.R.S.
THE HON. SIR JOHN McCALL, M.D., Agent-General for Tasmania.
THE HON. SIR THOMAS MACKENZIE, Agent-General for New Zealand.
MAJOR SIR THOMAS B. ROBINSON, Agent-General for Queensland.
SIR HENRY TANNER, C.B., I.S.O.
THE HON. SIR JOHN W. TAVERNER, Agent-General for Victoria.
LADY GOMME.
MISS ADLER, L.C.C.
D. L. ANDERSON, L.R.C.P., L.R.C.S., D.P.H., M.O.H. Doncaster.
WALDORF ASTOR, M.P.
P. BOOBBYER, M.D., M.S., M.O.H. Nottingham.
H. PERCY BOULNOIS, M.Inst.C.E.
AUGUSTUS BOWDER, Representative, Province of New Brunswick.
MRS. CLOUDESLEY BRERETON.
A. H. BYGOTT, M.D., D.P.H., M.O.H. West Suffolk C.C.
ALDERMAN S. COOK, Nottingham.
F. E. FREMANTLE, M.A., M.B., F.R.C.P., M.O.H. Hertfordshire C.C.
COUNCILLOR A. HARFORD, Liverpool.
A. WELLESLEY HARRIS. M.R.C.S., D.P.H., M.O.H. Lewisham.
PROF. A. BOSTOCK HILL, M.Sc., M.D., D.P.H., M.O.H. Warwickshire C.C.

T. Eustace Hill, M.D., D.P.H., M.O.H. Durham C.C.
E. W. Hope, M.D., D.Sc., M.O.H. Liverpool.
Herbert Jones, L.R.S.C.I., D.P.H., M.O.H. Hereford Combined Districts.
Alderman J. C. Julyan, Poole.
Prof. H. R. Kenwood, M.B., D.P.H., F.R.S.E., M.O.H. Stoke Newington.
C. W. Kimmins, D.Sc., M.A., Chief Inspector (Education) L.C.C.
Hon. Andrew Kirkpatrick, Agent-General for Sonth Australia.
The Rev. D. Scott Lidgett.
Leslie Mackenzie, M.A., M.D., LL.D., Local Government Board, Edinburgh.
A. J. Martin, M.Inst.C.E.
Councillor A. C. Melluish, St. Marylebone.
The Rev. F. B. Meyer.
A. Newsholme, C.B., M.D., D.P.H., Local Government Board.
Charles Porter, M.D., D.P.H., M.O.H. St. Marylebone.
G. Eric Pritchard, M.A., M.D.
W. Schooling.
H. D. Searles-Wood, F.R.I.B.A.
Colonel B. Skinner, M.V.O., Commandant, Royal Army Medical College.
P. Caldwell Smith, M.A., M.D., D.P.H., M.O.H. Wandsworth.
Alderman W. G. Stewart, Doncaster.
Prof. G. Sims Woodhead, M.D., F.R.C.P., F.R S., Cambridge.

Societies and Institutions appointing Representatives on Committee.

British Institute of Social Service, Percy Alden, M.P.
County Councils Association, J. Willis Bund.
Institute of Sanitary Engineers, E. H. Blake.
King's College Hospital, Lieut.-Col. C. F. Fellows.
Middlesex Hospital, A. G. R. Foulerton, F.R.C.S., L.R.C.P.
National Association for the Prevention of Consumption, Dr. Henry W. McConnel.
National Council of Adult Schools Union, E. J. Fulwood.
National Housing and Town Planning Council, H. R. Aldridge.
National Union of Trained Nurses, Miss Thurston.
Rural Housing Association, Miss A. Churton.
St. Bartholomew's Hospital, Henry L. Florence.
Social Welfare Association, A. H. Paterson.
Women's Imperial Health Association, Miss E. M. James, B.A.
Women Sanitary Inspectors' Association, Mrs. R. Durrie Mulford.

Secretary.
E. White Wallis, F.S.S.

Assistant Secretary.
W. J. Durrie Mulford.

The Committee have decided that Health Week, 1914, shall be celebrated from November 15th to 21st.

FORTHCOMING MEETINGS.

Sessional Meeting.

London, Tuesday, February 10th, at 7.30 p.m., "The King Edward VII. Welsh National Memorial Sanatorium at Pont-y-wal, South Wales," to be opened by Edwin T. Hall, F.R.I.B.A.

Leeds.—End of February.

Southampton.—March.

Birmingham, Friday, March 27th, Discussion on "The Certification of Milk and its effect on the general Milk Supply," to be opened by Wilfred Buckley.

On Saturday, March 28th, visits will be made to Sanatoria.

Students' Lectures.

The Fifty-seventh Course of Lectures and Demonstrations for Sanitary Officers will commence on Monday, February 2nd.

Course of Lectures on School Hygiene, including Elementary Physiology, and for Women Health Visitors, School Nurses, and Tuberculosis Visitors, will commence on Monday, February 16th.

Course of Practical Training for Meat Inspectors will commence on Wednesday, February 18th.

The Special Course on Food and Meat Inspection, arranged for Army Officers and Professional Men, will commence on April 1st.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors Qualifying for Membership, for Inspectors of Nuisances, in School Hygiene, including Elementary Physiology, and for Women Health Visitors and School Nurses :—

Plymouth, Jan. 23rd and 24th.	Preston, Feb. 13th and 14th.
Hull, Feb. 6th and 7th.	Hereford, Feb. 27th and 28th.

Ordinary General Meeting.

The Ordinary General Meeting is fixed for Wednesday, April 29th, at 4 p.m.

Lecture to the Institute.

Wednesday, April 29th, at 5 p.m., on "The bearing of Comparative and Experimental Investigations on the Association of Cancer with Chronic Irritation," illustrated by lantern slides, by E. F. Bashford, M.D., Ch.B., Director Imperial Cancer Research Laboratory.

Institute Dinner.

The Institute Dinner will be held in May.

Calendar for January and February, 1914.

As far as at present arranged.

JANUARY.

23 F.
24 S. } Examinations—Plymouth.

FEBRUARY.

2 M. Lecture for Sanitary Officers, at 7 p.m. Sanitary Law. A: Public Health Acts—English, Scotch, and Irish, by Charles Porter, M.D., B.SC., M.O.H. Marylebone.

4 W. Lecture for Sanitary Officers, at 7 p.m. Sanitary Law. B: Public Health (London) Act, etc., by Charles Porter, M.D., B.SC.

6 F. Lecture for Sanitary Officers, at 7 p.m. Sanitary Law, C: Factory and Workshop Act, etc., by Charles Porter, M.D., B.SC.

6 F.
7 S. } Examinations—Hull.

9 M. Lecture for Sanitary Officers at 7 p.m. Duties of a Sanitary Inspector—General, A: Outdoor, by Charles Porter, M.D., B.SC.

10. Tu. Demonstration of Book-keeping in a Sanitary Inspector's Office, at Town Hall, Islington, N., at 6.30 p.m., by James R. Leggatt, Supt. Public Health Department.

Sessional Meeting, London, at 7.30 p.m. "The King Edward VII. Welsh National Memorial Sanatorium at Pont-y-wal, South Wales," to be opened by Edwin T. Hall, F.R.I.B.A.

11 W. Inspection and Demonstration at L.C.C. Lodging House, Kemble Street, Drury Lane, W.C., at 2.30 p.m.

Lecture for Sanitary Officers at 7 p.m. Duties of a Sanitary Inspector—General, B: Indoor, by Chas. Porter, M.D., B.SC.

13 F. Lecture for Sanitary Officers, at 7 p.m. Duties of a Sanitary Inspector—C: Offensive Trades, by Charles Porter, M.D., B.SC.

13 F.
14 S. } Examinations—Preston.

Inspection and Demonstration in the District of Chiswick, at 3 p.m. Conducted by J. H. Clarke, Chief Sanitary Inspector.

16 M. Lecture for Sanitary Officers at 7 p.m. Elementary Statistics, by A. Greenwood, M.D., B.SC., D.P.H., M.O.H. Kent C.C.

Lecture for Health Visitors, at 7 p.m. General Structure and Functions of the Body, by G. Eric C. Pritchard, M.A., M.D.

18 W. Inspection and Demonstration in the District of Islington, at 2.30 p.m. (number limited). Conducted by James Leggatt, Supt. Public Health Dept.

Lecture for Sanitary Officers, at 7 p.m. Water: Composition, Pollution and Purification, by A. Greenwood, M.D., B.SC., D.P.H., M.O.H.

20 F. Lecture for Sanitary Officers, at 7 p.m. Infectious Diseases, by A. Greenwood, M.D., B.SC., D.P.H., M.O.H.

Lecture for Health Visitors, at 7 p.m. Personal Hygiene, by G. Eric Pritchard, M.A., M.D.

21 S. Inspection and Demonstration at the Kensington Disinfecting Station, at 2.30 p.m. Conducted by G. M. Pettit, Chief Sanitary Inspector.

23 M. Lecture for Sanitary Officers, at 7 p.m. Methods of Disinfection, by A. Greenwood, M.D., B.SC., D.P.H., M.O.H.

Lecture for Health Visitors, at 7 p.m. The Growth and Development of the Child, by G. Eric C. Pritchard, M.A., M.D.

24 Tu. Lecture for Sanitary Officers, at 7 p.m. Elementary Science, by Alan E. Munby, M.A., A.R.I.B.A.

25 W. Inspection and Demonstration in the District of Chiswick, at 3 p.m. (number limited). Conducted by J. H. Clarke, Chief Sanitary Inspector.

Lecture for Sanitary Officers, at 7 p.m. Elementary Science, by Alan E. Munby, M.A., A.R.I.B.A.

27 F. Lecture for Health Visitors, at 7 p.m. Physical Development, by James Kerr, M.A., M.D., D.P.H.

28 S. Inspection and Demonstration at the Southall Norwood Sewage Works, at 2.15 p.m. Conducted by Reginald Brown, M.INST.C.E., Engineer and Surveyor.

LIST OF HONORARY FELLOW, FELLOWS, MEMBERS, AND ASSOCIATES

ELECTED DECEMBER, 1913

HONORARY FELLOW.

59 1913. Dec. GORGAS, William C. (Colonel), *c/o Military Attaché to American Embassy, 123, Victoria Street, S.W.*

FELLOWS.

1591 1901. *F 1913. Dec.* DISNEY, George William, M.INST.C.E., *Sanitary Engineer to the Government of Behar and Orissa, Ranchi, India.*

3287 1912. *F 1913. Dec.* GILRUTH, John Anderson, F.R.S.EDIN., D.V.SC., M.R.C.V.S. (*His Excellency the Administrator, Northern Territory*), *Government House, Darwin, Northern Territory, Australia.*

3304 1912. *F 1913. Dec.* JONES, Guy Carleton (Colonel), M.D., C.M., M.R.C.S., *Director-General, Medical Service of the Militia of Canada*), *Department of Militia and Defence, Ottawa, Canada.*

3060 1911. *F 1913. Dec.* MANCHESTER, Ernest James Theodore, M.C.E., *Albert Street, Brisbane, Queensland.*

3115 1911. *F 1913. Dec.* ROBERTSON, William, M.D.GLAS., D.P.H., (*M.O.H.*), *Public Health Office, 35, Charlotte Street, Leith.*

1917 1905. *F 1913. Dec.* SNAPE, Alfred Ernest, M.SC., *South African College, Cape Town.* [*Hon. Secretary, South African Branch.*]

MEMBERS.

* Marked thus have passed the Examination of the Institute in Sanitary Science as applied to Buildings and Public Works.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

§ Marked thus have passed the Institute's Examination for Sanitary Surveyors (India).

3571 1913. Dec. AYLEN, Walter Weymouth, M.D., C.M., *Dominion Quarantine Officer, Montreal, Canada.*

3572 1913. Dec. BAHRI, Diwan Chand, B.SC.(ENG.)GLASG., *Jhelum, Punjab, India.*

3573 1913. Dec. Bhattacharjie, Jobindra Nath, B.SC.(ENG.)GLASG., *Post Office, Shridharpur, Jessore, Bengal, India.*

3574 1913. Dec. Bowmer, John James, B.SC.(TECH.), *Wirksworth, Derby.*

3590 1913. Dec. *‡Carter, John Ireland, 103, *Mansfield Street, Sherwood, Nottingham.*

3575 1913. Dec. Daw, Hilder, ASSOC.M.CAN.SOC.C.E., *King's Hall Buildings, St. Catherine Street, Montreal, Canada.*

3591 1913. Dec. §Dutt, John Prionath, *Saugor, Central Provinces, India.*

3592 1913. Dec. §Dutt, Sarah Chardra, *Neils Gate, Lucknow, India.*

3576 1913. Dec. ‡Gatzemeyer, Laurence John Francis, (*Assistant Quarantine Officer and Inspector of Food and Drugs*), "*Register*" *Buildings, Lipsom Street, Port Adelaide, South Australia.*

3593 1913. Dec. *Gooding, Arthur T., 53, *Park Road, Battersea, S.W.*

3577 1913. Dec. ‡Herring-Shaw, Alfred, M.SC.(TECH.), *Holly Lea, Ramillies Avenue, Cheadle Hulme, Cheshire.*

3578 1913. Dec. Hood, Archibald John Graeme, 91, *Clanranald Avenue, Notre Dame de Grace, Montreal, Canada.*

3579 1913. Dec. Laberge, Louis, M.D., (*M.O.H.*), *Medical Officer of Health, City Hall, Montreal, Canada.*

3580 1913. Dec. Lall, Jadubans, B.SC.(ENG.)GLASG., *Lall Bhawan, Tikari, Gaya, India.*

3581 1913. Dec. Madnani, Tikamdas Bhickchand, L.C.E. BOMBAY, *Civil Engineer, Shikarpur, Sindh, India.*

3582 1913. Dec. Mehta, Ramchandra, B.A.PUNJAB, *State Engineer, Nabha State, Punjab, India.*

3583 1913. Dec. Morgan, Ernest Edmund, A.R.I.B.A., *Borough Architect, Town Hall, Swansea.*

3584 1913. Dec. Mullin, Dr. Robert Hyndman, *Director, Laboratory Division, Minnesota State Board of Health, Minneapolis, Minn., U.S.A.*

3585 1913. Dec. Newsome, Harold Firth Vessey, 8, *Victoria Avenue, Cheadle Hulme, Cheshire.*

3594 1913. Dec. §Printer, Kaikhasru, *Hirjibhai, Sayaji Building, Balaram Street, Grant Road, Bombay, India.*

3586 1913. Dec. Rutherford, Nathaniel John Crawford (*Major R.A.M.C.*), M.B., B.CH.(DUB.), D.P.H., 5, *Charlemont Terrace, Cork, Ireland.*

3595 1913. Dec. §Saksena, Debi Prasad, *Rekobganj, Lucknow, India.*

3587 1913. Dec. Singh, S. Anokh., B.SC.PUNJAB, B.SC.(ENG.)LOND., *c/o North Brook Society, 21, Cromwell Road, S. Kensington, S.W. (Bakhar, Shahpur District, Punjab, India.)*

3588 1913. Dec. Sutcliffe, Joseph, B.SC.(TECH.), ASSOC.M.INST.C.E., 3, *Slade Grove, Longsight, Manchester.*

3596 1913. Dec. §Verma, Nand Ram, B.SC.(ENG.)DURH., *Jullunder City, Punjab, India.*

3589 1913. Dec. Waters, Harry George, M.R.C.S., L.R.C.P., D.P.H., (*M.O.H.*), 71, *Lensfield Road, Cambridge.*

ASSOCIATES.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

v Marked thus have passed the Examination for Women Health Visitors and School Nurses.

s Marked thus have passed the Examination in School Hygiene, including Elementary Physiology.

6368 1913. Dec. Denley, Charles, 238, *Manchester Road, Preston.*

6369 1913. Dec. Donaldson, Richard Russell, *Sanitary Inspector, Dunedin, Otago, New Zealand.*

6370 1913. Dec. Mair, James Douglas, *City Sanitation Department, Municipal Office, Colombo, Ceylon.*

6371 1913. Dec. Younger, David Campbell, *Assistant Surveyor and Sanitary Inspector*, 2, *Holmleigh, Barrow Green Road, New Oxted, Surrey.*

6372 1913. Dec. ‡Abey, Edmund Lusby, 109, *Willingham Street, Grimsby.*

6373 1913. Dec. ‡Annear, Richard William, "*Homeland,*" *Abbots Langley, Herts.*

6374 1913. Dec. ‡Boys, Henry, 37, *Robin Hood Hill, Berry Brow, Huddersfield.*

6375 1913. Dec. vClark, Miss Charlotte, *Maltby, Rotherham.*

6376 1913. Dec. vGibson, Miss Ethel, *Ty-Bryn, Charles Street, Bridgend, Glam.*

6377 1913. Dec. sHanson, Joseph Eli, *Quarry House, Ossett Lane, Earlsheaton, Dewsbury.*

6378 1913. Dec. vHayden, Miss Alice Elizabeth, 6, *Friarage Gardens, Hartlepool.*

6379 1913. Dec. ‡Jones, Frederick William, 131, *Gell Street, Sheffield.*

6380 1913. Dec. vMennem, Miss Margaret, *Nurses' Home, Amble, Northumberland.*

6389 1913. Dec. ‡Menon, Chittarjil Parameswara, *Ernakulam, Cochin State, India.*

6381 1913. Dec. ‡Mitchell, John Edwin, 13, *Hull Road, Hedon, near Hull.*

6382 1913. Dec. ‡Payne, Miss Ruby Catherine Cavah, "*Cavah,*" *Dagmar Avenue, Wembley Hill, Middlesex.*

6383 1913. Dec. ‡Penty, Robert, *Londesbro' Estate Works, Selby, Yorks.*

6384 1913. Dec. sRoberts, Myers, 171, *St. Lawrence Road, Tinsley, Sheffield.*

6385 1913. Dec. ‡Shaw, William, 17, *Eleanor Street, South Shields.*

6386 1913. Dec. vStead, Miss Rose E., *West Road, Prudhoe-on-Tyne, Northumberland.*

6387 1913. Dec. ‡Stringfellow, Fred, 13, *Green Street, Consett, Co. Durham.*

6390 1913. Dec. vWadsworth, Miss Harriet B., 32, *Ashbourne Road, Edgbaston, Birmingham.*

6388 1913. Dec. ‡Wills, Henry Graham, *Belgrave Street, Kogarah, New South Wales.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY.

DECEMBER, 1913.

ACADEMIES (BRITISH).

National League for Physical Education Improvement. Eighth Annual Report, 1913. 37 pp., 8vo. London, 1913. *The League.*

Society of Architects. Year Book, 1913–14. 169 pp., 4to. London, 1913. *The Society.*

Westminster Hospital Medical School. Sessions, 1913–14. 64 pp., 8vo. London, 1913. *The School.*

ACADEMIES (COLONIAL AND FOREIGN).

American Society of Civil Engineers. Transactions, Vol. LXXVI., December, 1913. 2,289 pp., 8vo. New York, 1913. *The Society.*

Bombay Improvement Trust. Administration Report for the year ending 31st March, 1913. 155 pp., 8vo. Bombay, 1913. *The Trust.*

Institute of Medical Research. Report for 1912. 71 pp., 8vo. Kuala Lumpur. 1913. *The Institute.*

Royal Academy of Sciences, Amsterdam. Proceedings, Vol. XV., Parts I. & II., and Das Gehirn eines Amanrotisch-Idioten Mädchens von Dr. C. Windkler und Frau J. Van Gilse-van-West. 8vo. Amsterdam, 1913. *The Academy.*

Royal Society of New South Wales. Transactions, Vol. XLVII., Part I. 112 pp., 8vo. Sydney, 1913. *The Society.*

Board of Education. Annual Report of the Chief Medical Officer for 1912. 414 pp., 8vo. London, 1913. *The Board.*

Bombay City Improvement Trust. Two Lectures dealing with the Trust's work, by J. P. Orr, I.C.S., and G. Owen Dunn. 8vo. Bombay, 1911. *The Trust.*

Chalmers, *A. K., M.D., D.P.H.* A Page in the Natural History of Pulmonary Tuberculosis. 14 pp., 4to. London, 1913. *The Author.*

Darwin, *Major Leonard, D.Sc.* Eugenics and National Economy. 16 pp., 8vo. *W. Whitaker, B.A., F.R.S.*

Delépine, *S., M.B.* Post-Graduate Instruction in Tuberculosis. 3 pp., 8vo. *The Author.*

Hardware Trade Journal. Benn's Encyclopædia of Hardware, 1914. 680 pp., 4to. London, 1913. *The Author.*

Hodgetts, *Charles A., M.D., D.P.H.* Refuse Collection and Disposal. 12 pp., 8vo. *The Author.*

Hoffman, *F. L., LL.D.* The Decline of the Tuberculosis Death-rate, 1871–1912. 37 pp., 8vo. *The Author.*

——— The Statistical Experience Data of the Johns Hopkins' Hospital, Baltimore, M.D., 1892–1911. 161 pp., 8vo. Baltimore, 1913. *The Author.*

Kelynack, *T. N., M.D.* The Tuberculosis Year Book and Sanatoria Annual, 1913–14. 476 pp., 8vo. London, 1913. *John Bale, Sons & Danielsson, Ltd. (Publishers).*

MEDICAL OFFICERS OF HEALTH AND OTHER SANITARY REPORTS.

Aberdeen, Sept. & Oct. 1913 .. .. *Matthew Hay, M.D.*
Bengal, 1912 .. .. *Major W. W. Clemesha, M.D., D.P.H.*
Berkshire C.C., 1912 .. .. .. *G. C. Taylor, M.D., D.P.H.*
Bethnal Green, 1912 .. .. .. *G. P. Bate, M.D.*
Buckinghamshire C.C., 1912 .. .. *A. H. Hogarth, M.B., D.P.H.*
Cornwall C.C., October, 1912 .. *Robert Burnet, M.B., D.P.H.*
Dumbarton C.C., 1912 (San. Inspector) *D. Dunbar.*
Kent C.C., 1912 .. .. .. *A. Greenwood, M.D., D.P.H.*
Lancaster, 1912 .. .. .. *E. Sergeant, L.R.C.P., M.R.C.S.*
Leeds, 1912 .. .. *J. Spottiswoode Cameron, M.D., B.Sc.*
London, Four Weeks ending 15th November, 1913 .. .. .. *W. J. Howarth, M.D., D.P.H.*
Norfolk C.C., 1912 .. .. .. *J. T. C. Nash, M.D., D.P.H.*
Nottingham, 1912 .. .. .. *P. Boobbyer, M.D.*
Sheffield, 1912 .. .. .. *H. Scurfield, M.D., C.M.*
Sidmouth U.D.C., 1912 .. .. *W. H. Peile, M.D., D.P.H.*
Staffordshire C.C., 1912 .. .. *George Reid, M.D., D.P.H.*
Warmley R.D.C., 1912 .. .. *Thos. Aubrey, M.B.*
Warwickshire C.C., 1912 .. .. *A. Bostock Hill, M.D., D.P.H.*
Wiltshire C.C., 1912 .. .. .. *J. Tubb-Thomas, L.R.C.P.I.*

London, *Corporation of.* Report on Actinomycosis in Ox-Tongues imported from the Argentine Republic, by W. J. Howarth, M.D., and Herbert Williams, M.D. 12 pp., fcp. London, 1913. *The Authors.*

New York, U.S.A. Report of the Director of Investigation for 1911. 611 pp., 8vo. Albany, 1913. *G. M. Price, M.D. (Director of Investigation).*

Ontario. Report relating to the Registration of Births, Marriages, and Deaths for the year ending 31st December, 1912. 430 pp., 8vo. Toronto, 1913. *W. J. Hanna (Registrar-General).*

Registrar-General, England and Wales. Census, 1911, Vol. IX. 289 pp., 8vo. London, 1913. *Bernard Mallet (Registrar-General).*

Rietschel, *Prof. Dr. Ing. H.*, *and* **Brabbee**, *Prof. Dr. K.* Leitfaden für Lüftungs und Heizungs Anlagen. 683 pp., 8vo. Berlin, 1913. *The Authors.*

"Sanitary Record and Municipal Engineering." Year Book and Empire Directory of Municipal Authorities and Officials. 204 pp., 8vo. London, 1913. *The Sanitary Publishing Co.*

Stewart, *A. W., D.Sc.* A Manual of Practical Chemistry for Public Health Students. 76 pp., 8vo. London, 1913. *John Bale, Sons & Danielsson, Ltd. (Publishers).*

Surrey C.C. Report on the Wey Valley Floods in Relation to Public Health, 24 pp., 8vo. Kingston-on-Thames, 1913. *E. C. Seaton, M.D., F.R.C.P., F.C.S.*

United States Public Health Service. Digest of Comments on the Pharmacopœia of the United States of America and on the National Formulary for 1911. 683 pp., 8vo. Washington, 1913. *Rupert Blue (Surgeon-General).*

Western Australia. Report on the Medical, Health, Factories, and Early Closing Department for 1912. 98 pp., 8vo. Perth, 1913. *J. W. Hope, F.R.C.P.*

The following Journals and Periodicals have been received in the Library during 1913.

WEEKLY.

British Architect.
British Journal of Nursing.
British Medical Journal.
Builder.
Chicago Health Bulletin.
Contract Journal.
Domestic Engineering.
Engineering.
Engineering News (New York).
Hardware Trade Journal, The.
Hospital.
Indian Engineering.
Irish Builder and Engineer.
Journal d'Hygiène.
Journal of the Royal Society of Arts.
Lancet.
Local Government Chronicle.
Local Government Journal.
London County Council Gazette.
Meat Trades Journal.
Medical Officer.
Municipal Journal.
Nursing Times.
Sanitary Record.
School Government Chronicle.
Southern Builder.
Surveying and Housing World.
Surveyor and Municipal and County Engineer.
Veterinary Record.
" News.

MONTHLY AND QUARTERLY.

Agricultural Economist.
Annales des Ponts et Chaussées.
Annali D'Igiene Sperimentale.
Bollettino Sanitario.
British Journal of Inebriety.
British Journal of Tuberculosis.
Bulletin du l'administration du Service de Santé et de l'Hygiène (Bruxelles).
Bulletin Mensuel.
Canadian Nurse.
Canadian Public Health Journal.
Child-Study.
Concrete.
Deutsche Vierteljahrsschrift für öffentliche Gesundheitspflege.
Engineering Magazine.
Ferro-Concrete.
Giornale della Reale Società Italiana d'Igiene.
Glasgow Medical Journal.
Health.
Illuminating Engineer.
Iowa Health Bulletin.
Journal of Hygiene.
Journal, American Institute of Architects.
Journal of the Architectural Association.
Journal of the Royal Army Medical Corps.
Journal of the Royal Institute of British Architects.
Journal of the Royal Meteorological Society.
Journal of the Royal Statistical Society.
Journal of the Sanitary Inspectors' Association.
Journal of the Society of Architects.
Journal of State Medicine.
La Salute Pubblica (Perugia).
La Technique Sanitaire.
Local Government Review.
Le Mois Medico-Chirurgical.
L'Hygiène Scolaire.
Malaya Medical Journal.
Meteorological Record.
New York State Board of Health, Monthly Bulletin.
Paris Office International d'Hygiène Publique (Bulletin Mensuel).
Paris Médical.
Plumber and Decorator.
Plumbing Trade Journal.
Public Health.
Registrar-General's Returns: England and Wales, Scotland, and Ireland. Weekly, Monthly, and Quarterly.
Revue d'Hygiène et de Police Sanitaire.
Royal Colonial Institute Journal.
Royal Engineers' Journal.
Sanitarisch-demographisches wochen Bulletin der Schweiz.
Sei-i-Kwai Medical Journal.
Surveyors' Institution, Transactions of.
Symons's Meteorological Magazine.
Water.

COLONIAL NOTES.

DOMINION OF CANADA.

Quebec.—In sequence with the development of Examinations for Sanitary Officers in Canada, referred to in the last issue of the Journal, a Board of Examiners has been established in the Province of Quebec, the Examiners being:—

Chairman—E. P. Lachapelle, M.D., Chairman of Provincial Board of Health of Quebec, and Commissioner for the City of Montreal.

T. W. Ludlow, B.Sc., M.A., L.R.I.B.A., Associate Professor of Architecture, McGill University, Montreal.

Louis Laberge, M.D., Medical Officer of Health, Montreal.

J. A. Beaudry, M.D., Medical Inspector, Provincial Board of Health, Montreal.

R. S. Lea, B.A.Sc., Consulting Engineer to the Provincial Board of Health, Montreal.

A. J. G. Hood, Veterinary Surgeon, Chief Food Inspector, Montreal.

T. A. Starkey, M.B., D.P.H.Lond., Professor of Hygiene, McGill University, Montreal.

Examinations will be held in 1914, and full particulars can be obtained from Dr. T. Starkey, McGill University, Montreal, who is acting as Hon. Local Secretary to the Board.

Manitoba.—The first Examination arranged by the Board recently established in Winnipeg was held on October 29th and 30th, 1913.

BRITISH GUIANA.

A Board of Examiners has been established in British Guiana, where a Course of Training is already arranged for Sanitary Inspectors; the following officers have been asked to serve as Examiners:—

J. E. Godfrey, M.B., Surgeon-General.

E. P. Minett, M.D., M.R.C.S., L.R.C.P., Government Assistant Medical Officer of Health.

J. H. W. Park, M.Inst.C.E., Colonial Civil Engineer.

W. S. Wise, M.B., M.R.C.S., L.R.C.P., Government Medical Officer of Health.

Dr. E. P. Minett has consented to act as Hon. Local Secretary.

LIST OF EXHIBITS ADDED TO THE MUSEUM, 1913.

Diseased Meat. Four specimens specially mounted between two glass covers so as to be suitable for handling and classroom use.
Purchased of Reynolds & Bransome, Ltd., Leeds.

Diseased Meat. Heart and tongue of a pig suffering from the disease commonly known as hog measles, slaughtered at public abattoirs, Port Elizabeth, South Africa. *S. Henry Kemp, Chief Sanitary Inspector, The Port Elizabeth Municipality, South Africa.*

Diseased Meat Photos. Various specimens. *Dr. Arnold Evans.*

Domestic Appliances. The "Artic" meat safe, circular in form with sliding door, made to stand or to be suspended.
Ewart & Son, Ltd., 341–350, Euston Road, N.W.

Drinking Cup. Individual. Made in one piece of specially treated waterproof paper. *Public Service Cup Co., Brooklyn, N.Y.*

Dust and Refuse Collection. Working models of the Zurich System of Dust and Refuse Collecting, shows a specially designed dust-bin of such a shape as to ensure a thorough discharge of its contents when reversed on the top of the cellular dust-cart. The cells have also been designed not only to ensure complete discharge when the bottom of the cells are removed, but also to obviate the raking over of the refuse in order to get a full load. The top of the householder's dust-bin is a sliding one with a mechanical device for keeping it closed; a groove at one end of the sliding top fits into a bar running along the side at the top of the dust-cart cell. The dustman collects his bin, raises it to the top level of the cell, pushing the groove on to the bar, reverses the closed dust-bin, pushes it along the top, which thus automatically and simultaneously removes the sliding top of the bin and of the cell. The dust-bin is drawn back, the dust-cart cell is automatically closed by the operation, and simultaneously the sliding top of the bin is closed and fixed before being returned to the householder.

For districts where no destructor exists a composite cellular cart is employed, with a simple mechanical crank device easily manipulated by one man, which, on being turned, pushes back the composite body a distance of several feet over the tip and automatically releases the bottoms of the cells. The time taken to effect this operation and discharge the whole of the cells is three minutes.

Where a municipality possesses a destructor a special trolley is employed, which is designed to take two or more separate cells. When filled they are lifted out by a crane, carried to the destructor, and the operation of discharge is performed mechanically directly over the furnace, the furnace opening being automatically removed simultaneously with the bottom of the cell and *vice versâ*. The cell is then hoisted out of position and conveyed to the trolley. *The Builders' and Contractors' Plant, Ltd., 17, Victoria Street, S.W. British Agents.*

Fish. A series of life-size water-colour drawings. Various round and flat marketable fish.
Prepared for the Committee by Miss I. de C. White Wallis.

Flies. Chart giving various remedies to be adopted.
"The Medical Officer," 36–38, Whitefriars Street, E.C.

Floor Sweeping Powders. *The Dusmo Co., Ltd., Stratford, E.*

Food Values. Series of diagrams of various food analyses, including army rations. *Colonel Beveridge.*

Analyses of margarine and butter, exhibiting in glass tubes the proportional quantities of each constituent.
Prepared by Otto Monsted & Co., Southall.

Forbe's Water Steriliser, Household type; capacity, 1½ gallons per hour; heated by gas, consumption two feet per hour. The water is raised to a temperature of 212° F., but by passing the incoming water tubes it is cooled down, and leaves the steriliser only a few degrees above its temperature at entering. *L. Lumley & Co., Ltd., Minories, E.C.*

Hollow Wall Construction. The Clare-Tucker Cavity Wall Tie, made in blue brick, impervious to damp, interlocking with specially prepared wall bricks. Can be used in constructing ventilating shaft.
G. Tucker & Sons, Ltd., Loughborough, Leicestershire.

House Drainage. Defective jointing of 6-in. stoneware drain pipe, cement deposit left on inside, blocking up about one-fourth of bore.
J. H. Clarke, Chief Sanitary Inspector, U.D.C. Chiswick.

Infant Clothing. Model showing suitable clothing for infant out of doors in all weathers. Sleeping basket for same.
Miss M. Const. Barker, St. Christopher's, Tunbridge Wells.

Iron Pipe Jointing Material. Section of cast-iron pipe joint, 8 inch diameter water main, jointed with Ribbonite Lead.

Four hanks of Ribbonite Lead showing how the material is made up ready for use. It is used cold and caulked.
The British Ribbonite Co., Ltd., 122, Newgate Street, E.C.

Lantern Slides. Bacteriology: Sanatorium, *Dr. Arnold Evans;* Water Supply, House Drainage, Refuse Disposal, Heating, Lighting, and Ventilating, *H. Percy Boulnois.*

Open-air Ward for Tubercular Cases, City of York Fever Hospital. Four views showing construction, position, etc.
Dr. E. M. Smith, Medical Officer of Health, York.

Pipe Joints. Various type lead and iron pipe joints. *Dr. H. Franklin Parsons.*

School Desk Fitting. Model of hinged footrail showing how it may be turned up for sweeping under. *The Educational Supply Association, Ltd., 40–44, Holborn Viaduct, E.C.*

Tuberculosis. Chart giving various directions for protection against.
The Medical Officer," 36–38, Whitefriars Street, E.C.

Wall Covering. Semi-circular Panels of "Emdeca" Enamelled Zinc of various colours and patterns. *The Emdeca Metal Decoration Co., Ltd., 97, Queen Victoria Street, E.C.*

Water Filtration, Municipal. Detail drawing of the Candy "Compound" Filter, with combined pre-filter and double scour, especially designed for dealing with turbid and muddy waters, or waters that require chemical treatment prior to filtration.
The Candy Filter Co., Ltd., 5, Westminster Palace Gardens, Artillery Row. Victoria Street, S.W.

Water Softening and Sterilising. Detail Drawing, Elevation, and Section, "Permuttit" water softening plant, constructed to remove temporary and permanent hardness in water. Domestic type.
Water Softeners, Ltd., 91–93, Queen Victoria Street, E.C.

Window Sash and Frame. The "Austral" window, in which the sashes are connected by pivotted levers secured to the sashes and frames, so that the sashes may be opened as louvres or turned inwards for cleaning.
The Austral Window Balance Co., Ltd., 3, MacDonald's Lane, Corporation Street, Manchester.

NEW PREMISES EQUIPMENT FUND.

DONATIONS DURING 1913.

The following additional donations have been received from Associates, and the Council desire to express their thanks to them for the help thus given in the equipment of the Institute's premises:—

Miss M. W. Coston		0	10	6
T. Meazey	(4th Donation)	0	5	0
		£0	15	6

December 31st, 1913.

HEALTH EXHIBITION, EXETER, 1913.

ADDITIONAL AWARD.

Bronze Medal.

George Waller & Son.

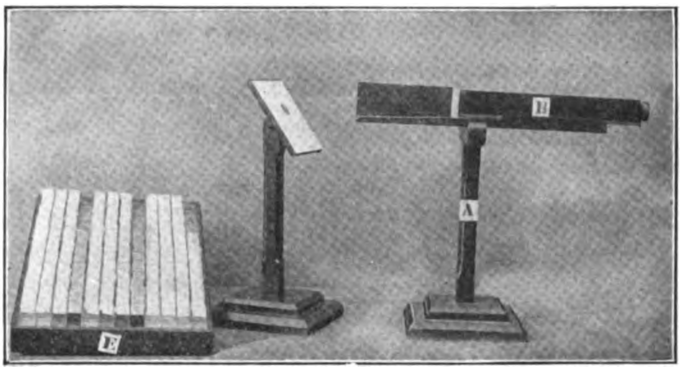
Briscoe's Alternating Arrangement for Contact Beds.

EXHIBITS FOR WHICH MEDALS HAVE BEEN AWARDED AT THE HEALTH EXHIBITION, EXETER, 1913.

Lovibond's Tintometer Apparatus and Developments.

Silver Medal.

To The Tintometer, Ltd.



Apparatus for diagnosing specific diseases by colour changes in the blood, and for noting changes during treatment, also diagrams illustrating co-relation of the colour standards with wave lengths of corresponding spectrum colours.

Size.—Oxidising Tintometer size about 18 in. by 12 in.

Price.—£14.

In Parts.—Separate parts can be obtained if desired.

Manufactured by The Tintometer, Ltd., Colour Laboratories, Salisbury, Wilts.

Humane Slaughtering Implements.

Bronze Medal.

To Royal Society for the Prevention of Cruelty to Animals.

The instruments exhibited included:—(1) The Humane Killer, suitable for bulls, oxen, large pigs and horses; (2) Captive-bolt Pistol, for calves, sheep and pigs; (3) The Spring-bolt Pistol, for horses and ponies, to be used in coal mines where cartridges are prohibited.

Prices.—(1) £1 15s.; (2) £1 10s.; (3) £1 10s.

Manufactured and sold at cost price only by The R.S.P.C.A., 105, Jermyn Street, London, S.W.

"Virol."

Silver Medal.

To Virol, Ltd.

Virol.—A highly concentrated food, consisting of bone marrow, red bone marrow of the medullary structure of ox rib and calf bones, malt extract, eggs, and lemon syrup.

Sold in jars, at 1s., 1s. 8d., and 2s. 11d., and family jars, 11s. 6d.

Manufactured by Virol, Ltd., 152-166, Old Street, London, E.C.

Compressed Sanitary Towels and Accouchement Outfits.

Silver Medal.

To Southall Bros. & Barclay, Ltd.

Compressed Towels.—Reduced by pressure into a very small compass.

Sizes.—(Four) A, B, C and D.

Prices.—1d., 1½d., 2d. and 2½d. each.

Accouchement Outfit Sets containing necessary requisites.

Sizes.—Nos. 1, 2, 3, 4, and 5.

Prices.—10s. 6d., 21s., 42s., 63s. and 105s. each.

Manufactured by Southall Bros. & Barclay, Ltd., 19, 20 and 21, Lower Priory, Birmingham.

Sanitary Automatic Weighing and Indicating Machines.

Silver Medal.

To Messrs. W. & T. Avery, Ltd.

"Avery Visible Weighers." Automatic weighing machines for shop use. No loose weights to contaminate the hands or harbour dirt; less handling of goods.

Sizes.—1 lb., 2 lb., 4 lb., 6 lb., 8 lb., and 20 lb.

Manufactured by W. & T. Avery, Ltd., Soho Foundry, Birmingham.

Horlick's Malted Milk.

Silver Medal.

To Horlick's Malted Milk Co.

Horlick's Malted Milk is a blending of milk, wheat, and barley malt, rich in proteids and carbo-hydrates.

Prices.—1s. 6d., 2s. 6d., and 11s., of all chemists and stores.

Manufactured by Horlick's Malted Milk Co., Slough, Bucks., England.

Reid's Junketta Essence, Powder, and Tablets.

Bronze Medal.

To Broom, Reid, & Harris.

Prepared entirely in Devonshire, and contains no boracic or salicylic acid, formalin, or any other injurious preservative.

Sizes.—Three.

Prices.—6d., 1s., and 1s. 9d.

Manufactured by Broom, Reid, & Harris, Exeter.

Gas Cooking and Heating Appliances.

Silver Medal.

To Exeter Gas Light & Coke Co., 11 and 12, East Southernhay, Exeter.

Hygienic Value of Electrical Appliances.

Silver Medal.

To Exeter Corporation Electricity Department, 184, Sidwell Street, Exeter.

Non-Poisonous Paints.

Bronze Medal.

To Mitchell & Son, 9, Bartholomew Street East, Exeter.

Hospital Filter, with Thermometer attached.

Silver Medal.

To Stack & Brownlow.

Hospital Filter, with Thermometer attached, for providing sterile water of any desired temperature for use after surgical operations. The filtering medium is composed of porous porcelain.

Prices.—On application.

Manufactured by Slack & Brownlow, Gorton, Manchester.

Formalide Sprayer.

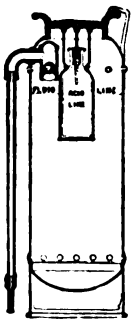
Bronze Medal.

To the Exors. of the late William Sharratt.

The "Formalide" Sprayer is self contained, made of strong copper, with a powerful pump down the centre, and a spraying rod connected with the tap by a rubber tube. The spray emitted is very fine, and a small quantity of liquid will cover a large area of wall space when used in this sprayer. Disinfectant is poured in until the sprayer is two-thirds full, the remaining space being left for compressed air. There is a safety valve in the filler cap. The pump handle, when hooked to the body, serves to carry the sprayer. The spraying rod can be extended by the addition of extra lengths.

Sizes.—No. 1, 3 pints, £2 5s.; No. 2, 1 gal., £3 10s.; No. 3, 2 gal., £4 10s.

Manufactured by The Exors. of the late William Sharratt, Tower Works, Clayton, Manchester.



"Galvo" Chemical Fire Extincteur for Transport.

Bronze Medal.

To The Webb Lamp Co., Ltd.

Made and stocked in three Standard sizes.

Prices.—In copper, 1 to 3 gallon size, 27s. 6d, to 55s. each.
In lead-coated steel, 22s. to 40s.

Tested to 350 lbs, hydraulic.

Manufactured by The Webb Lamp Co., Ltd., 11, Poultry, London, E.C.

Imperial Electric Vacuum Cleaner.

Bronze Medal.

To Mark Rowe & Sons, 266 and 267, High Street, Exeter (Agents).

This illustration shows the Imperial Electric Vacuum Cleaner, which is a portable machine of about the same weight as a carpet sweeper. It operates from any electric lighting circuit at a cost of ½d. per hour.

The illustration shows the machine extracting the dust from carpets and rugs. This Cleaner is also supplied with attachments for cleaning furniture, mattresses, curtains, in fact every article in the household.

The machine takes about the same current as an ordinary electric lamp, and is exceedingly simple and easy to use.

The Imperial Cleaner is sold at £10 10s., and is supplied on approval where required.

Manufactured by Electric Appliances Co., Ltd., 26, Rosebery Avenue, London, E.C.

"Ronuk."

Bronze Medal.

To "Ronuk" Ltd.

A sanitary floor polish for the first preparation and maintenance of all kinds of wood flooring, linoleum, furniture, etc., composed largely of antiseptic materials.

Sizes.—Supplied in small tins from 3d. upwards for ordinary household purposes, also large tins in concentrated and liquid forms, for use in hospitals and other large establishments.

Manufactured by "Ronuk" Ltd. (Sanitary Polish Manufacturers to H. M. The King), Portslade, Brighton, Sussex.

"Clyro" Closet with Swivel Outlet.

Bronze Medal.

To Stourbridge Glazed Brick and Fire Clay Co., Ltd.

The pan itself is made of highly glazed Georgian ware; the trap is made of lead, and is secured to the pan by means of a brass collar joint.

The trap is reversible, allowing the outlet to be turned in any required direction.

The only joint is always under the water line.

In case of stoppage, the trap is readily accessible by simply removing the brass collar.

Full particulars and prices on application.

Manufactured by The Stourbridge Glazed Brick & Fire Clay Co., Ltd., Holly Hall, Nr. Dudley.

Stafford School W.C. with Inspection Cap.

Bronze Medal.

To Stourbridge Glazed Brick & Fire Clay Co., Ltd.

This pan has a solid back, which fits close up to the wall face, thus preventing dirt or dust, etc., accumulating at the back of the pan, a vertical inlet nozzle, and the trap is provided with a large brass screw inspection cap, easily removed in case of stoppage.

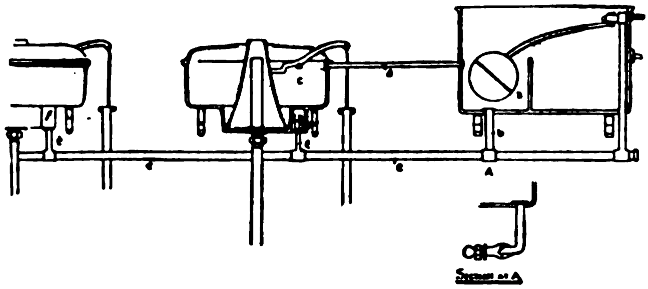
Full particulars and prices on application.

Manufactured by The Stourbridge Glazed Brick & Fire Clay Co., Ltd., Holly Hall, Nr. Dudley.

"Gravisede" Flushing System.

Bronze Medal.

To Stourbridge Glazed Brick & Fire Clay Co., Ltd.



In this arrangement there is only one ball valve and one overflow to each range, instead of one to each cistern, and the whole range may be drained and left perfectly dry whenever desired.

Full particulars and prices on application.

Manufactured by The Stourbridge Glazed Brick & Fire Clay Co., Ltd., Holly Hall, Nr. Dudley.

"Rougemont" Bath.

Bronze Medal.

To Rowe Bros. & Co., Ltd., 192, High Street, Exeter.

White porcelain enamelled cast-iron; side recesses to accommodate soap and sponge trays; nickel plated syphonic overflow capable of discharging the water, even if both taps are running at full bore; easily removed for cleaning, and at same time giving access to the glass enamelled waste trap; nickel plated hot and cold taps with butterfly head; soap and sponge trays, complete; plain white japanned finish outside.

	Length.		Width.		Depth.	
	ft.	in.	ft.	in.	ft.	in.
Outside ..	6	2½	2	8	2	1½
Inside ..	5	6	2	0	1	8½

Price.—£12 10s.

"Brandon" Lavatory-Basin.

Bronze Medal.

To Rowe Bros. & Co., Ltd., 192, High Street, Exeter.

Made in porcelain enamelled fireclay, with basin entirely free from metal parts. In the overflow chamber provided behind the bowl is fixed a conical hollow plug, the side of which acts as a stopper to the discharge orifice of the basin. All parts being entirely exposed allows them to be kept perfectly clean. Made in two sizes, 20 in. by 18 in., and 24 in. by 18 in., over all.

Prices.—£4 and £4 9s. 6d. respectively, including hot and cold special taps, and cast-iron cantilever brackets, complete.

Lead Pipes.

Silver Medal.

To Rowe Bros. & Co., Ltd.

Round Pipes from $\frac{1}{8}$ in. to 6 in. bore, in substances varying from $\frac{1}{16}$ in. to 2 in. thick, suitable for soil, ventilating, water supply, chemical work, and gas supply. Rectangular pipes for rain water.

Prices.—On application.

Manufactured by Rowe Bros. & Co., Ltd., 192, High Street, Exeter.

Bed-Pan Cleanser.

Bronze Medal.

To Rowe Bros. & Co. Ltd., 192, High Street, Exeter.

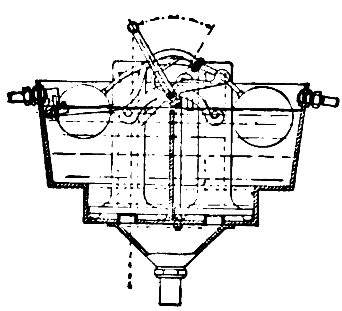
Bed-pan washer, and trap, in one piece, of white enamelled Wessex fireclay, carried on white porcelain enamelled brackets, 3-gallon fireclay syphon cistern, brass pull and guide, brass flush pipe; $2\frac{1}{2}$ in. gun-metal handled taps for "cold" only; connecting pipes to bed-pan and urine bottle jets; hinged plate-glass cover in heavy brass frame, with brackets to wall. The plate-glass cover enables cleansing process to be seen without risk of splashings.

Price.—£15.

Newland Two-Flush Cistern.

Bronze Medal.

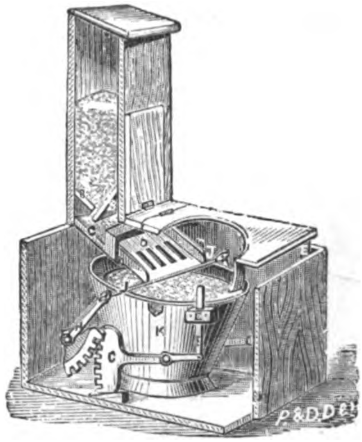
To The Two-Flush Cistern Co., Ltd.



The Newland two-flush cistern provides a second flush of water if required, immediately after one has been given, without waiting for the cistern to refill. Each of the two water chambers is provided with a well at the bottom, and a siphon tube of the usual form. The plungers are each separately operated by a swinging hammer or rocker brought into play by pulling the chain. The inlet ball valve, controlling the water supply to both compartments, is governed by a pair of balls which throw the lever into position for starting the flush from either of the two compartments which may contain water at the time.

The siphoning tubes both discharge into a common well, from which the water is carried off by a common flow-pipe of ordinary standard size. The Newland two-flush cistern is very little larger than the usual pattern, and only permits a flush of two gallons of water at one operation.

Manufactured by The Two-Flush Cistern Co., Ltd., 52, Gracechurch Street, London, E.C.



Self-acting Earth Closet.

Silver Medal.

To The British Sanitary Co.

When the closet is being used, the seat is depressed about an inch, forcing down the rods EE on each side of the seat, which raise the long and weighted end of the segmental toothed levers G and G, which in turn throw back the long end of the lever H.. This duplex action is coupled by the cross bar J, to which is attached the shovel D; this is then withdrawn to the back of the bevelled shelf C, and receives the charge of earth, etc. When the seat is relieved, the weight of the lever brings out the shovel quickly, thus spreading the earth, etc., over the excreta.

Sizes.—40 ins. high, 27 ins. deep, and 23 ins. wide.

Prices.—47s. 6d. to £6 6s.

Manufactured by The British Sanitary Co., 341 Bath Lane, Glasgow.

Wireless Electric Pipe Locator.

Bronze Medal.

To Edwin A. Mansfield & Co.

For tracing the position of any metal pipe of any size, and at any depth up to 20 feet below the surface of the ground, by means of an induced electric current, made audible through a telephone.

Prices.—From £15 to £20.

Manufactured by Edwin A. Mansfield & Co., New Brighton, Cheshire, England.

Non-Poisonous Paints.

Bronze Medal.

To Soper & Ayers.

Permanent in colour, non-poisonous, and of great covering capacity, either on wood, plaster, brick, or cement walls. Forty-four direct colours and white are manufactured for stock. Any shade or tint can be produced.

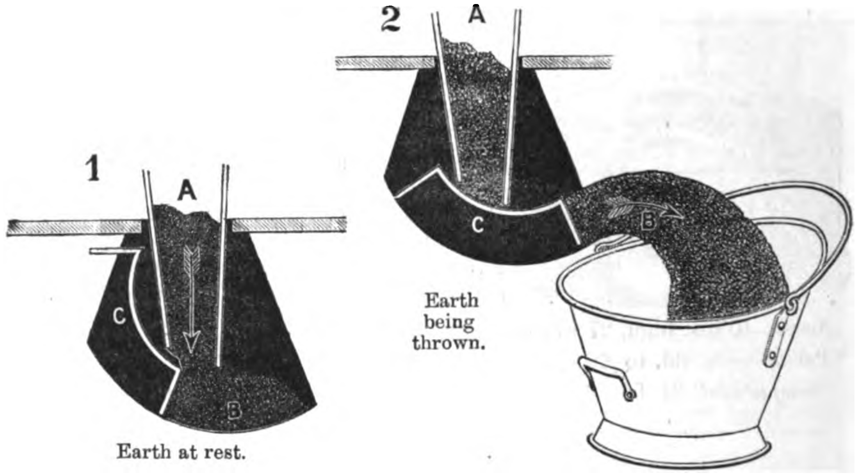
Price.—22s. per cwt.

Manufactured by Soper & Ayers, The Permaline Paint Works, Pavilion Place, Exeter.

Earth Closets, with "Chucker" Action.

Bronze Medal.

To Moule's Patent Earth Closet Co., Ltd.



The Chucker action of Moule's new patent is a simple mechanical contrivance, by which a measured quantity of earth is cast or "chucked" forward and somewhat upwards, so that the top and front portion of the contents of receptacle are covered, even when the receptacle is full. The movement is applied to the pull-up and the automatic actions.

Sizes and Prices.—Various, according to fittings. There are thirty varieties.

Manufactured by Moule's Patent Earth Closet Co., Ltd., 2, Guilford Street, London, W.C.

Devon Stoneware.

Bronze Medal.

To Candy & Co., Ltd.

Glazed Stoneware Sewer Pipes, Bends, Junctions, Syphons, Traps and Interceptors, Street and Yard Gullies, Channel Pipes.

Prices on application.

Manufactured by Candy & Co., Ltd., Heathfield Station, Newton Abbot, Devon.

Briscoe's Alternating Arrangement for Contact Beds.

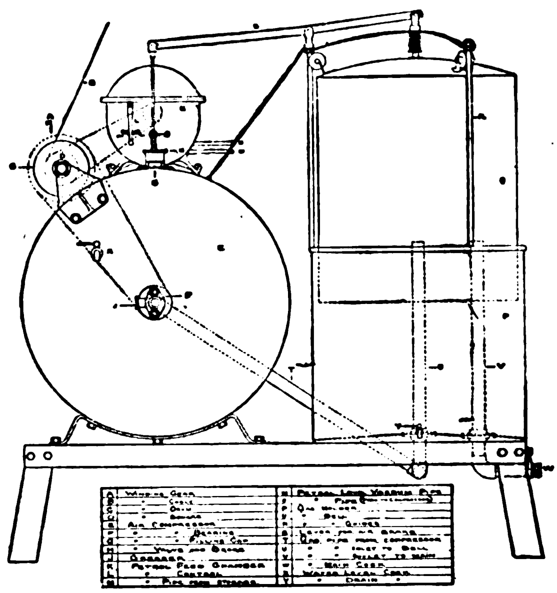
Bronze Medal.

To George Waller & Son, Phœnix Iron Works, Stroud, Glos.

"The Beacon Light" (Valveless) Petrol Gas Generator.
Silver Medal.

To The Beacon Light (Valveless) Gas Generator, Ltd.

Consists mainly of four parts, viz. :—1. Winding gear (a) ; 2. Petrol Feed (k) ; 3. Air Compressor (e) ; 4. Gas Holder (p).



Winding gear (a) consists of a winding drum (c), attached to and around which runs a steel cable (b) (which has a high factor of safety), and through which is imparted the motive power, which is supplied by weights suspended by pulley blocks. The winding drum (c) is fixed to a stiff steel spindle, supported in ample and well-lubricated bearings in a rigid framing, which is bolted to the compressor drum. Fixed to the spindle is a substantial square for winding and a chain wheel for driving the Petrol Feed Spindle, fixed to which is a gun-metal arm with swinging gun-metal buckets. These fittings are enclosed in a cast-iron case, as is also an adjustable gun-metal cam, which tips up the buckets into a trough and also controls the amount of petrol needed, being actuated by the lever (l). The bottom of the case acts as a well, being supplied by the copper pipe (m) from the outside storage tank (the correct level being maintained by means of a vacuum pipe), and into which well the buckets dip as they revolve, emptying the petrol so obtained into the trough, from whence it passes to the Air Compressor (e) wherein it mixes with the air. The compressor, which is driven by a chain from the winding gear, consists of an outer case of $\frac{1}{8}$ in. steel plate welded up at the joints and galvanized, and an inner vaned drum of lead-coated iron, mounted on a steel spindle bushed with gun-metal, where it runs in the gun-metal bearings attached to the case, and a gland adjusted by bolts is fixed to prevent leakages. The outer case is partly filled with liquid, on which the vaned drum acts to obtain the necessary air volume and pressure, the correct level being maintained by the cock (x), while the cap (g) is used for filling. The incoming air is controlled by the valve (h), which is of gun-metal, which in turn is controlled by the amount of gas used through the medium of the gas bell (q) and the lever (s). The air so obtained is by the action of the compressor thoroughly mixed with the petrol, and passes out in the form of gas through the copper pipe to the Gas Holder (p) through another copper pipe, filling the gas bell, and passing out again through the pipe (v) to the main, a cock (w) being provided. The outer portion is made of lead-coated iron, the guide rod (s) being rivetted on, and one of which acts as a fulcrum for the brake lever (s), which closes the air valve (h) when the bell is full.

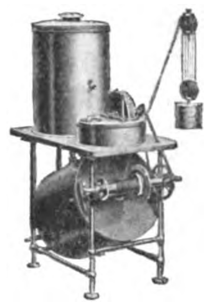
Prices on application.

Manufactured by The Beacon Light (Valveless) Gas Generator, Ltd., 105, Horseferry Road, London, S.W.

"Aerogen" Petrol Gas Plant.

Bronze Medal.

To Hubber & Son, 85 and 86, South Street, Exeter (Agents).



Aerogen Safety Air Gas Generators, for the lighting of country houses and isolated buildings. Aerogen Gas is also used for heating and cooking stoves.

Sizes.—From a 15-light Bungalow Plant up to 10,000 lights for villages and country towns.

Prices on application.

Manufactured by "Aerogen" Gas Co., 30–33, Bolsover Street, Gt. Portland Street, London, W.

Cement in Various Stages of Manufacture.

Bronze Medal.

To Lyme Regis Cement Co., Ltd., Lyme Regis, Dorset.